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INSTITUTE FOR DEFENSE ANALYSES

Advanced Operational Concepts for Information Sharing and Coordination Centers

L.B. Scheiber, Project Leader

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PREFACE

The Department of Defense moves a great deal of war materiel between the forts and depots in the United States and its military elements overseas. The Delaware River Maritime Enterprise Council (DRMEC) has tasked IDA to initiate the design, development, and demonstration of an online system to improve the security and accountability of the movements of the war materiel between the forts and depots, and the ports within the United States. Reference 1 documents that effort through FY05. During FY06, the effort was expanded to include the concept of the centers operating in distributed and virtual modes. The ability to operate as a distributed or virtual center in these days of seemingly continuous threats of terrorist activity as well as natural disasters is, for all practical purposes, mandatory. On the other hand, operating as a distributed and virtual center frees the operators from the need to be collocated at a central location, which can help ease the normal daily conflicts many of us face as well as to reduce costs, like those associated with travel.

This document is being provided at the request of the sponsor, DRMEC, to bring together in one place the significant elements of the various briefings and other material provided during the efforts associated with this portion of the task. An additional report, documenting work associated with the other aspects of the tasking will also be provided.

The IDA team consisted of Dr. Lane B. Scheiber, Project Leader, Mr. Michael H. Anstice, Mr. Barrett Drifmeyer, Dr. Joseph E. Hartka, Mr. Jeffrey J. Karrels, Mr. Philip N. Miller, and Mr. Ernest R. Smothers. The team wishes to acknowledge the immense benefit derived from the comments by those who reviewed the briefing including General Larry D. Welch (Ret.), Ms. Ruth L. Greenstein, Mr. Phillip L. Major, Dr. George E. Koleszar, Ms. J. Katharine Burton, Dr. Kyle A. Morrison, Dr. Daniel Y. Nakada and Mr. Philip J. Walsh as well as those who provided comments on this document.

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EXECUTIVE SUMMARY

A. BACKGROUND

The Federal Government has been working to increase the security of U.S. ports, including the supply chains that move the goods and materiel that pass through these ports. This is especially true in the case of war materiel moving among forts and depots in the United States and theaters of operation. This requires meaningful and seamless integration of the security forces at the local, state, and federal level, as well as the logistics resources throughout the logistics chain. This has been very difficult because of a lack of information sharing among the large number of organizations involved as well as the lack of a common operating picture (COP). Therefore, coordinating efforts to ensure prompt and safe delivery of the cargo was difficult at best. Knowledge of cargo location and when it will enter a specific jurisdiction is of paramount importance to guarantee its safe movement. The process also lacked communications capability to quickly alert the various security personnel who respond to critical situations.

Following the attacks of 9/11, the Delaware River Maritime Enterprise Council (DRMEC), a Pennsylvania not-for-profit organization, turned its attention to these problems. As a result, DRMEC, along with the Maritime Administration of the Department of Transportation (MARAD); the Philadelphia Regional Port Authority (PRPA); federal, state, county, and city law enforcement; the military; the Department of Homeland Security; and commercial organizations began to identify and establish first-order mechanisms for sharing information among the stakeholders. As part of this effort, DRMEC developed the concept of a center, called Regional Agile Port Intermodal Distribution (RAPID) Center, for managing the collection and distribution of the information pertaining to the movement of war materiel. In 2004, DRMEC tasked IDA to design, develop, and demonstrate an information sharing system to support RAPID Center that could provide all stakeholders with a common operating picture. Reference 1 provides details on the IDA system that supports RAPID Center.

B. EVOLVING SITUATION

While RAPID Center provides the participants with a common operating picture to help coordinate their efforts and ensure prompt and safe delivery of cargo, the situation has continued to evolve. The center was initially at a fixed facility at the port of Philadelphia. The center's capabilities

were also needed at other ports in the continental United States (CONUS). More operator-hours were needed to support this expansion. Conflicts regarding the use of key people arose as did the need of these people to be at multiple places at once. Further, alternative facility arrangements were needed in case a ship arrived late and the facility at the port of Philadelphia became unavailable to support the movement of its cargo. Terrorist acts, like those in London, continued to generate concerns about the advisability of centralizing control in single, fixed facilities. New approaches to the original fixed facility concept were needed.

C. IDA TASKING

In 2006, in task order ME1103, DRMEC tasked IDA to assist in the assessment and evaluation of DoD and commercial off-the-shelf technologies that would support the development of a virtual seaport operations center and, in task order ME1104, to initiate an effort to help identify approaches to evaluate how the then-current RAPID Center capabilities could be leveraged to support the creation of a virtual Marine Domain Awareness (MDA) center. IDA was also tasked to serve as a strategic advisor to DRMEC and to explore and recommend emerging technology to improve system capabilities.

D. IDA'S EFFORT

To meet the needs of the emerging situation, IDA developed concepts and provided demonstrations on approaches to permit RAPID Center to operate in two additional modes: distributed (over multiple facilities) and virtual (mobile). The center can also operate in any combination of the three modes—fixed facility, distributed, and virtual—which gives the center a significant range of options that can be applied to various situations. In all modes, the current approach is to have the computer system supporting RAPID center, along with the necessary databases, physically at IDA. Access to the system is via the Internet through secure communications.

In the fixed facility mode, which was the initial approach, all of the people associated with the center worked in a well-defined physical facility. The fixed facility was equipped with the computer equipment and Internet capability required to conduct operations associated with the center's mission. The original fixed facility is located in Philadelphia near the Packer Avenue Marine Terminal. RAPID Center has also operated from facilities near the ports in Savannah, GA, and Charleston, SC.

In the distributed mode, only a few personnel needed to carry out the operations associated with RAPID Center are at the port through which the cargo is moving. The remaining personnel are at known sites at various distances from the port. For example, the operators may be in the DRMEC headquarters in Trevor, PA, or even in their own homes. The only necessities are a high-speed Internet connection, a computer connected to the Internet, and a telephone. The telephone can be connected by land lines, a wireless service, or through the Internet via Voice Over Internet Protocol (VOIP).

The distributed approach was actually demonstrated in real-time. In December, 2005, a ship was late arriving at the port of Philadelphia. Because of the delay, the facility RAPID Center intended to use became unavailable. IDA suggested DRMEC move to a distributed mode. With IDA's help, some operators were sent to DRMEC's headquarters and others were sent home. Those sent to DRMEC's headquarters used DRMEC's high-speed Internet access. Those sent home had high-speed Internet access, like DSL, there. Except for the operators' physical locations, the operation was carried out as originally planned. The distributed approach was demonstrated again in February/ March 2006 for a ship operation in Savannah, GA.

The difference between the distributed and virtual modes is that, in the virtual mode, operators do not have to be in fixed or even known locations. They may be mobile or they may stop at a convenient location when the need to support the center arises. Generally, they would be expected to use computers, perhaps laptops, connected to the Internet by way of a broadband wireless service. Telephone support may be through a cell phone via a wireless provider or the Internet connection via VOIP.

The virtual mode was first demonstrated in July 2006 when a member of the IDA development team, equipped with a broadband wireless connection to his laptop and a cell phone, supported a ship operation while being driven from Virginia to Michigan. The broadband wireless provided access to the IDSS system and the cell phone provided voice communications. The phone was also equipped with IDA's tracking software so the operators within RAPID Center could track their mobile operator. No differences were noted in the support provided by the operator due to his being mobile.

E. CONTINUED DEVELOPMENT AND UTILIZATION

RAPID Center's mission continues to expand. For example, the Army's RESET program is in need of a means that will allow Army Materiel Command (AMC) to more closely track the location and status of the equipment in this program. The RESET program is an effort to expedite the restoration of military equipment returning from Iraq and Afghanistan to a deployable condition. In FY07, Congress provided more than $17 billion for the RESET effort, which translates to 117,000 major items. The Army estimates that in FY08 and beyond, it will require a minimum of $13.5 billion annually for the RESET program. Supporting this effort will require RAPID Center to take on a worldwide perspective.

Further, HQ Army G4 has the requirement to ensure that units have adequate equipment with which to train with as well as to deploy. Determining the status and location of a unit's equipment at any point in time can be difficult. However, the need is to track the status and location on a continuous basis. Supporting this effort will require additional expansion of RAPID Center's capability.

By their nature, these expansions would most likely add pressure to increasingly operate in distributed and virtual modes. This would then expectedly translate into an almost continuously varying mixture of fixed, distributed, and virtual modes.

In addition, the ability to operate in various mixtures of fixed, distributed, and virtual modes has application in other areas such as Emergency Management & Disaster Response centers. An example of this is the Virtual Maritime Domain Awareness Center that has been proposed to help improve the security of the ports of Philadelphia.[1] DHS awarded the grant to initiate the development of this center on May 4, 2007. At the writing of this report, tasking to IDA to support the design, development, and demonstration of this center is underway. The State of Arizona has also expressed interest in learning more about the technology to be used in this effort.

This project had a three fold purpose. First, it was to describe in some detail, the aspects by which a center could operate outside of a single, fixed facility. Many

[1] Reference 2.

reasons exist for not wanting to be confined to a single, fixed facility, including the lack of flexibility in the utilization of one's resources.

Second, the project was to arrange demonstrations of at least portions of RAPID Center operating in distributed and virtual modes.

Third, the project was to describe additional uses of the technology. That is, what other types of centers might benefit by being able to operate in a distributed mode and/or a virtual mode?

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BRIEFING REPORT

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BACKGROUND

A. BACKGROUND

1. Purpose

The purpose of this document is to describe the concepts of operations for the distributed and virtual information sharing and coordination centers in use at RAPID Center. Using the current system, we will demonstrate the concepts involved and describe other system applications for current and future use.

Purpose

- Describe concepts of operations for distributed and virtual information sharing and coordination centers
- Demonstrate concepts using current system
- Describe additional system applications

2. Introduction

Emergencies and disasters have been with us from the beginning of time. September 11th and hurricanes Katrina and Rita have provided strong indications that new approaches to emergency information management and response coordination are required. These disasters have made it clear that responses require the coordinated actions of many different organizations—not just police, fire, and rescue, but also others such as hospitals and temporary facilities to distribute food and provide shelter. In some cases, much of the infrastructure may need emergency repairs including those to electrical, communications, gas, roads, and water and sanitary facilities. Establishing priorities in these situations can be critical as some repairs may be of no value until others are completed. Coordinating all necessary activities may require extensive collaboration to bring about a timely and effective recovery.

To provide information to stakeholder organizations in order to help them to coordinate their efforts, centers need to be available when users need them. Some of these centers must be able to operate continuously at low-levels to monitor and maintain an awareness of the normal situation. They must be able to detect any activity that deviates from the norm, determine whether or not a noted change is significant, and continuously share that information with the stakeholders through a common operating picture. The centers must be able to become operational quickly at a higher level of intensity when a significant event occurs or evidence suggests that one might occur. Further, a center must be able to quickly alert its stakeholders when changes reach an agreed-to threshold.

Finally, because of the wide array of towns, cities, municipal areas, etc., that are subject to different types of natural or terrorist threats, the concept for centers must be easily adaptable to and replicated at many locations.

The centers as envisioned (and to a degree already in use) must be able to cope with various outages and public mayhem, function without operators having to be at specific locations, and allow stakeholders to collaborate without the need to be physically together. An adaptable information and coordination center capable of operating in a distributed and/or virtual mode provides the opportunity to effectively use vital resources in high demand situations.

Introduction

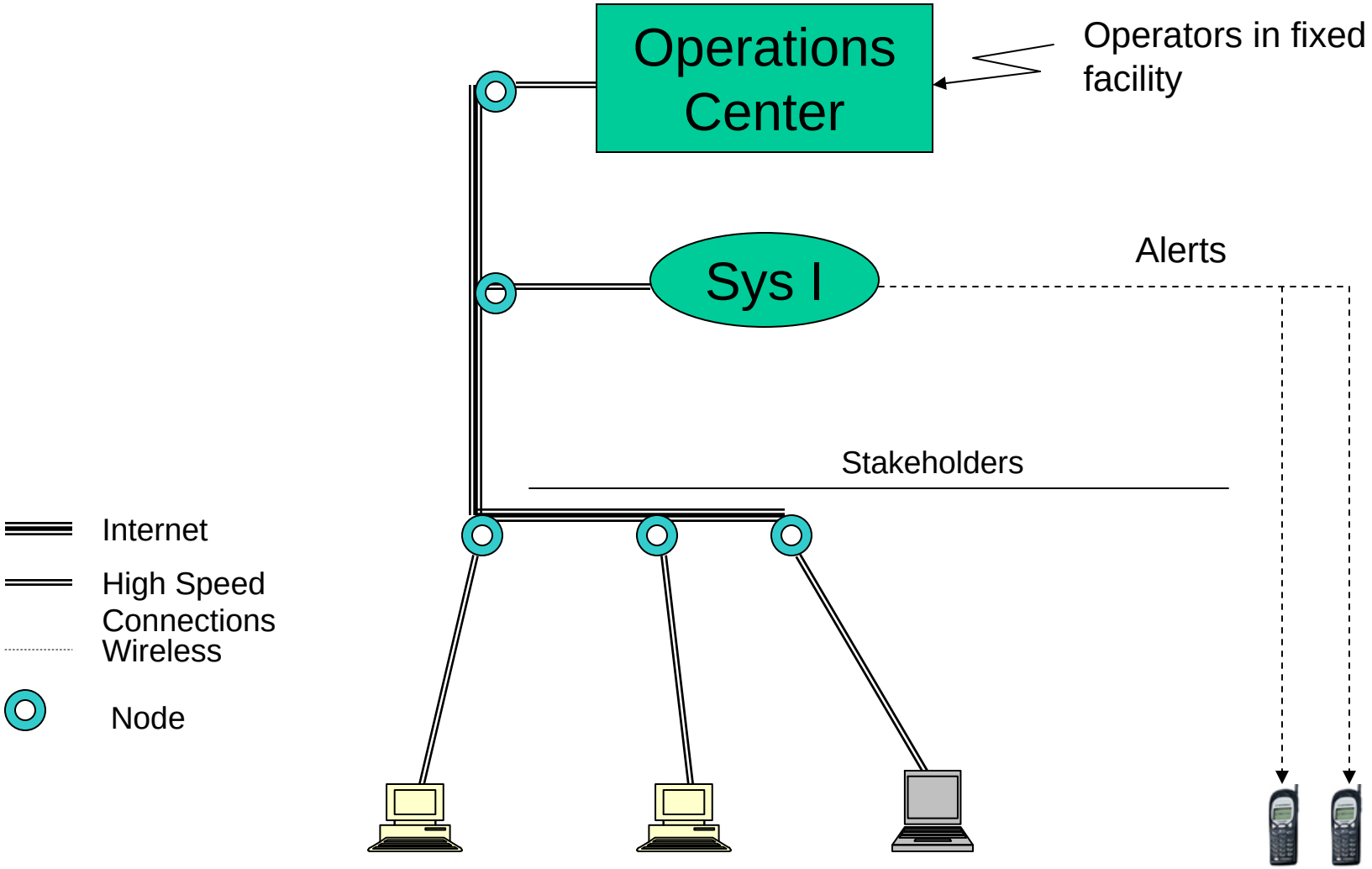
- Emergencies and disasters with us from the beginning of time.
  - 9/11, Katrina, and Rita recent indicators of the need for new approaches.
- Need monitoring and management centers that can:
  - Operate continuously at low-levels to monitor the overall situation and share awareness information among stakeholders
  - Quickly become fully operational when an event occurs or there is sufficient evidence that one might occur
  - Operate in spite of various outages and public mayhem
  - Function without operators being at specific locations
  - Allow stakeholders to collaborate without the need to be together
- Need a distributed and/or virtual approach that is adaptable to a variety of information sharing and coordination requirements.
- Many areas could use such a center as none are immune to natural disasters. Many may also have to deal with terrorism.

Many areas could use such a center because none are immune to natural disasters, e.g., avalanches, dam breaks, earthquakes, epidemics, tornados/cyclones, floods, fires, and oil spills. Many may also have to deal with terrorism.

However, emergency management and counterterrorism are only two of the uses of such centers. Considerable economic benefit could be derived by using such systems to keep areas working smoothly.

RAPID Center is an example of an adaptable center that provides a common operating picture to a variety of stakeholders to ensure the safe and timely movement of war materiel between the forts and the ports. Originally it operated as a centralized center—that is, all operations were done in a centralized facility. Increased use of the center's assets, including the processing of multiple ships at the same time and ships at ports outside of the Philadelphia area, have indicated a need for more advanced approaches, such as the capability to operate in distributed and virtual modes.

Centralized Center



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ADVANCED OPERATIONAL CONCEPTS

B. ADVANCED OPERATIONAL CONCEPTS

This section describes an approach to operating an information sharing and coordination center and a system to support it. It starts by *defining* how "adaptable," "distributed," "virtual," and "virtual collaboration" are used in conjunction with such a center.

After covering some *basics,* it provides an example of how such a center might *operate*, especially in the distributed and virtual modes. This is followed by a discussion of some *common features* provided by such centers including a common operating picture, alerts of unexpected as well as expected occurrences of significant events and the tracking of high-value assets. It closes with a discussion of *desired attributes* for such centers, and the systems that support them, from the point of view of someone who is considering building and operating such a center.

Advanced Operational Concepts

1. Definitions
2. Basics
3. Example of a Concept of Operations
4. Some Common Functions
5. Desirable Attributes
6. Communications Aspects

1. Definitions

The chart lists terms that will be defined on the following pages.

Definitions

a. Adaptable Center
b. Distributed Center
c. Virtual Center
d. Virtual Collaboration

Adaptable Center

- A center designed to be modified to fit the operational needs of a wide range of organizations, which might range from keeping the stakeholders of those organizations aware of specific situations to full, wide-area virtual collaboration to cope with major events.
- In addition, the center needs to be designed to maintain continuity-of-operations by having the capability to adapt to changes in the environment which occur during the response to an incident.

Distributed Center

A center operating in an electronic environment through which the center's operators can perform their tasks without having to be physically collocated, although they would be at fixed, pre-established positions.

Virtual Center

Similar to a distributed center, but where the operators may in fact accomplish their tasks while on the move or stopped at locations that have not been pre-established.

Virtual Collaboration

Virtual collaboration, in this report, means collaboration among people who are not collocated, but who are able to communicate via a system that supports efficient information sharing, i.e., by more than just voice or text.

2. Basics

For the purpose of this document, we assumed that stakeholder organizations have adequate means of providing command and control for their own units. In addition we assumed that the disaster's effects are sufficiently wide that different stakeholder organizations do not have a common boss, at least not one who can be called upon to provide the overall direction in the limited time available when the disaster strikes. We also assumed that stakeholder organizations are well-versed in their jobs and wish to carry them out in a coordinated manner.

On the other hand, it is well known that disasters do not adhere to territorial boundaries. Terrorists, to increase the effectiveness of their act, may actually use local boundaries in their plans in an attempt to take advantage of potential confusion resulting from responders from different locales suddenly having to work together. Thus, the focus here is to establish a center that stakeholders can quickly "go to" to share information and coordinate their activities.

When a disaster strikes, the unexpected happens. Some people flee the scene. Others rush to the scene. Reported tests of evacuation plans indicate roads become jammed. Actual evacuations associated with hurricanes Katrina and Rita seemed worse: some vehicles ran out of gas, others burned, emergency services became strained, and many people became stranded as the infrastructure, including the roads, proved to be inadequate to support the evacuations.

Basics

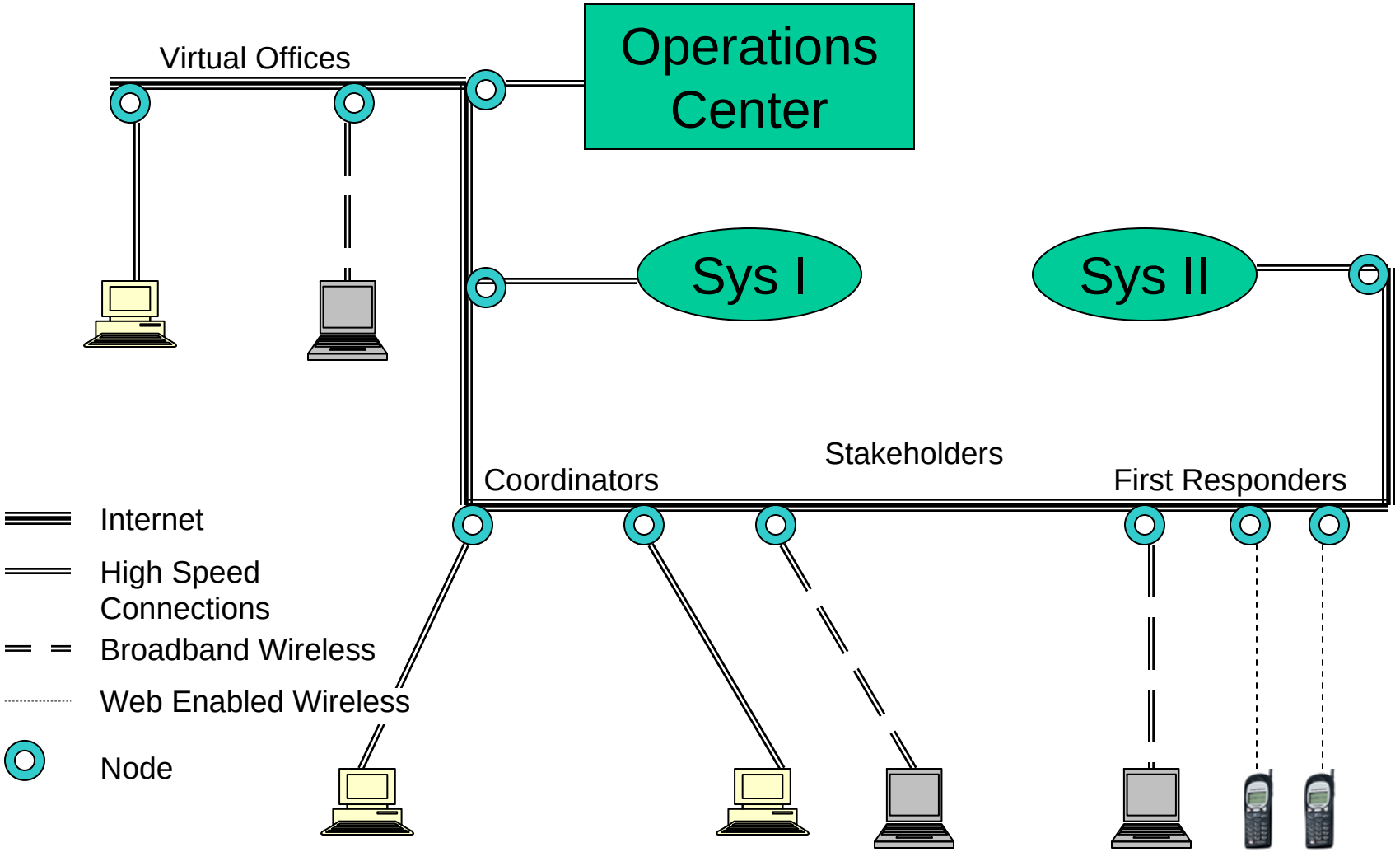
- Centers are needed for information sharing and coordination
- Not necessarily physically recognizable
- Able to quickly adapt to changing conditions
- Able to use existing communications assets
- Needs to be robust

Given the public bedlam that can be expected at the onset of a disaster, the idea of uniting stakeholders from a wide area to share information and coordinate activities seems difficult, if not impossible. It may not even be possible to get the center's operational team to one physical location. Thus, one must consider an electronic environment where the center's operators can perform their tasks without having to be collocated or (at least initially) even be physically in pre-established positions and where the stakeholders can gather electronically to share information and coordinate activities. One must consider distributed and virtual centers. While they may not be physically recognizable as centers, virtual centers can operate as if the operators and stakeholders were physically together. The chart illustrates an example of a center that has become operational without all of its critical people being able to physically make it there. It is connected to its operators, the systems that support it (Sys I & II, and the stakeholders by various communication elements, including the Internet. Pictured to the left of the Operations Center, which is a physical entity, are two of its operators who are unable to make it to the center. On the left is one who is portrayed as staying home (e.g., due to traffic congestion). The solid line indicates a wired connection from his PC to his provider (indicated by the blue donut).

The operator to the right has his laptop connected to the system by way of a broadband wireless network, which allows him considerable freedom of movement. For example, he could have been caught in traffic when he received the call from the center and decided to pull into a parking lot and use his laptop to join the operational team. Details of the communications options for the different situations are discussed in a later section.

On the left side of the lower part of the figure are the coordinating members of the stakeholders. Two are in physical locations with their PC connected by way of high-speed wired lines. The third one has his laptop connected via a broadband wireless connection. On the lower right are pictured the responders. One has a laptop connected by a high-speed wireless connection. The other two have web-enabled cell phones.

Connections for Distributed and Virtual Operations



3. Example of a Concept of Operations

This section presents an example of a Concept of Operations. In this example, the center has three levels of operation: L1–Monitor, L2–Alert, and L3–Operational.

For the most part the center will operate at the L1–Monitor level. At this level, its minimal staff will monitor all available relevant information and periodically provide stakeholders with reports consistent with the center's mission. Operational capabilities such as collaboration in a virtual center will always be supported by the center's personnel to facilitate stakeholders' use.

If the information available to the center indicates that the threat or potential of a disaster occurring has reached a pre-specified level, the center will move to the L2–Alert level of operation. The center will send out alerts to all senior-level stakeholders to inform them of the potential disaster occurrence. It will monitor these alerts to ensure that all senior members receive them and increase the frequency of the reports and the details in them. It will also begin to monitor locations of high-value assets of the prevention and response teams. The center's remaining operational team members will be put on alert status. Use of features such as virtual collaboration by the stakeholders will be expected to increase. *For example, if the dam appears to be in danger of breaking, the stakeholders might want to share, in map form, the latest information on the locations of houses where people are expected to need help and which organization will provide that aid and when.*

Example of a Concept of Operations

- A center might have several levels of operation
  - For example, L1–Monitor, L2–Alert, and L3–Operational.
- For the most part the center would operate at the L1–Monitor level
  - Minimal staff monitoring all relevant information
  - Periodically providing reports to stakeholders
  - Supporting functions such as virtual collaboration to facilitate use by stakeholders
- At pre-specified threat levels, the center would move to L2–Alert level operation and
  - Alert senior-level stakeholders of change in operational level
  - Increase frequency of reports and details in them
  - Initiate monitoring locations of high-value assets
  - Place center's full operational team on alert
  - Expect increased stakeholder use of features like virtual collaboration

If a disaster occurs, the center will move to its L3–Operational level. All center members will become active regardless of their location. *For example, one member, after receiving the alert, finds the Metro has stopped operating due to the disaster. He connects to the center by way of the DSL service in his home.*

Another member is shopping when he receives the alert that the center is going operational. The public is already agitated by news of the disaster and, as he is placing a call to the center, someone bumps him and his cell phone crashes to the cement floor and dies. He returns to his car only to find that public panic has resulted in traffic gridlock. He retrieves his laptop computer from the trunk of his car and turns it on. Using broadband wireless, he connects to the center. He establishes voice communications with the center using the VOIP capability built into his laptop.

The center is operational in a virtual mode.

Example of a Concept of Operations, cont.

- If a disaster occurs, the center will move to its L3–Operational level
  - Activate center's operational team members regardless of their locations. For example:
    - *Some may be advised to stay in place, e.g., connect to the center by way of the DSL service at their homes.*
    - *Others may be out and about when called. They may be caught in the mayhem that erupts as part of the public's response to the disaster. They may connect to the center's system using laptops equipped with broadband wireless and establish voice communications with the center using the VOIP capability built into their laptops.*
  - In this configuration, the center is operational in a virtual mode.

The center will also send out alerts to all senior-level stakeholders to inform them of the occurrence of the disaster. It will monitor these alerts to ensure that all senior members receive them. The reports will increase in frequency and more details will be added as information is amassed. It would also closely monitor the locations of high-value assets of the disaster response teams. Use of features such as virtual collaboration by the stakeholders will be expected to further increase. *For example, a barge hits and damages a bridge. A first responder uses a camera phone to take and upload pictures of the damage to the system's virtual collaboration feature to show details of the damage to the stakeholders. Stakeholders confer and provide a coordinated plan of action to their respective responders.*

Example of a Concept of Operations, cont.

- The center would also:
  - Send out alerts to all of the senior-level stakeholders to inform them of the occurrence of the disaster. It will monitor these alerts to ensure that all senior members receive them.
  - Increase frequency of the reports and details in them.
  - Closely monitor locations of high-value assets of disaster response teams.
  - Expect use of features, such as virtual collaboration, by stakeholders to further increase and for first responders to begin sending in photos and videos.
  - Verify availability of backup systems needed for continuity of operations

4. Some Common Functions

a. Information Sharing and Coordination Centers

Although the centers might support different types of situations—for example, different types of disasters, or even carry out other types of information sharing and coordination functions—they have a number of functions in common. This section discusses some of these in detail.

One of the basic motivators for these types of centers is to provide stakeholders, including decision makers and responders, with a COP. While operating with the same understanding of the situation is always helpful, it is mandatory for success when dealing with time-sensitive emergencies and disasters. Pictures, images, maps, streaming video, and reports can all be used to provide a COP that can be used to quickly transfer relevant information to the users.

Knowing the locations of one's assets can lead to reduced response time and increased response efficiency. Even better is being able to track them on maps in near-real-time.

Another basic motivator for these types of centers is to provide alerts to stakeholders in the event of the occurrence or potential occurrence of significant events.

These centers also provide the opportunity for real-time collaboration among the stakeholders in a virtual setting. In the past, conference calls have replaced physical collocation. Recently, collaboration software with its ability to display graphics and video has been used.

Some Common Functions
of Information Sharing and Coordination Centers

Provide:

- Common Operating Picture to all Stakeholders
  - Situation awareness
    - Pictures, images, maps, streaming video, reports
    - Examples—logistic & security
  - Map-based tracking of high-valued assets and materiel
    - Prevention and response assets
    - Materiel in transit
- Alerts to indicate occurrence or potential occurrence of significant events
- Real-time virtual collaboration

b. COP—Situation Awareness

One of the most important features of an information sharing and coordination center is to provide users with a COP. That means all users have access to the same material at the same time. The details of what this means depends on the users being served. For example, in the system that supports RAPID Center, the COP is centered around logistic and security information. For example, it includes the information in the cargo list such as the transportation status of each item being shipped. However, a system designed to combat terrorism might primarily exchange incident reports, and one for emergency management might exchange maps showing the location of all high-valued assets. In any event, the COP helps the different user organizations coordinate their activities and permits them to complete their tasks in a more efficient manner.

Common Operating Picture

Situation Awareness

Virtual Offices

Operations Center

Sys I

Sys II

Stakeholders

Coordinators

First Responders

Internet

High Speed Connections

Broadband Wireless

Web Enabled Wireless

Node

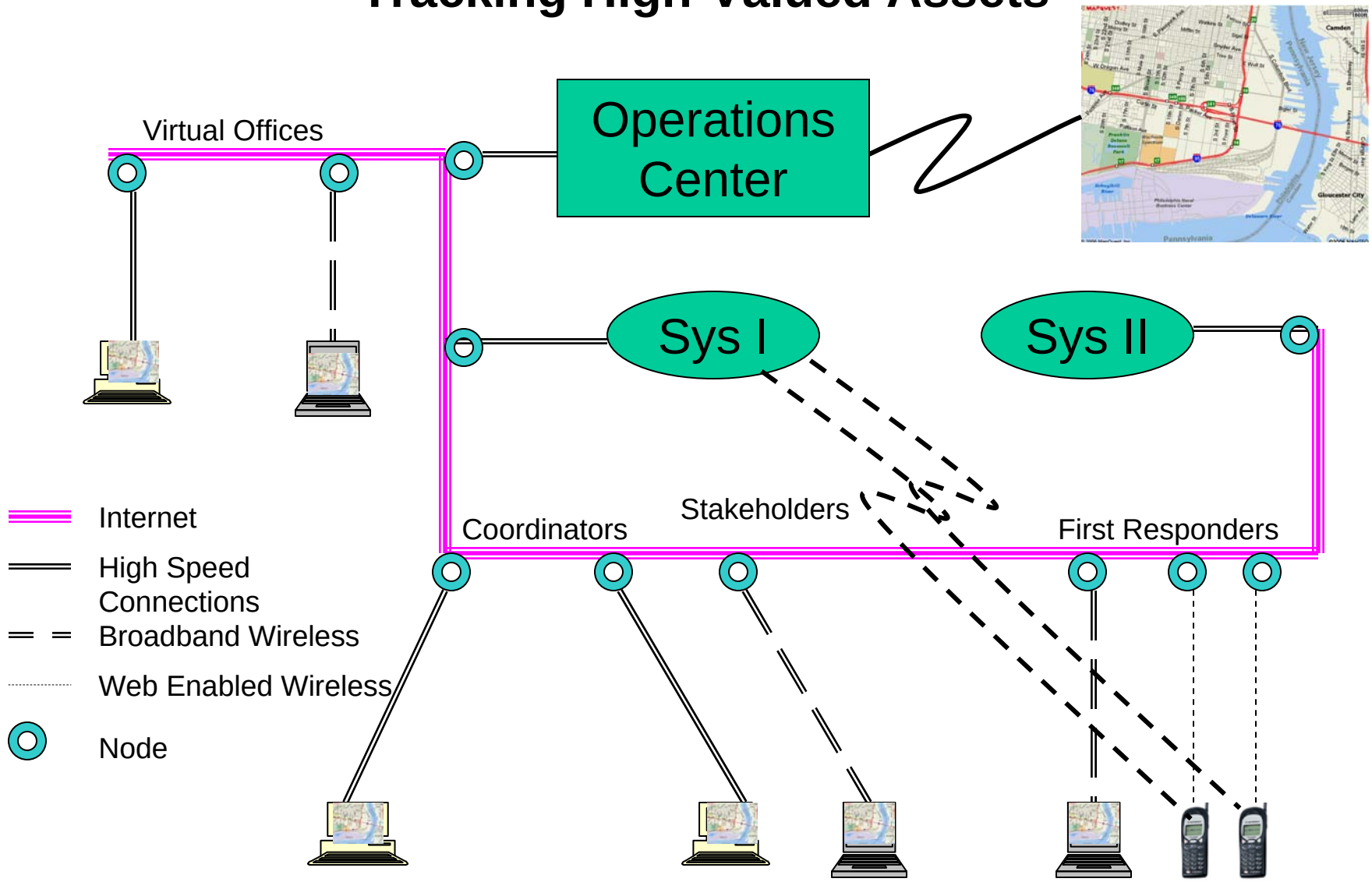
c. COP—High-Valued Asset Tracking

This chart shows the tracking of high-value assets. Shown here is the ability to track mobile phones, but other devices can be tracked as well. Generally, mobile devices are tracked using GPS—for example, with GPS enabled cell phones or devices made from cell phone modules. In some GPS enabled mobile phones a small program, like a Java applet, can be inserted into the phone's memory. The center can use its support system to direct the mobile phone to provide the center with the mobile phone's GPS position. The system can display that phone's position on a street map or on a satellite image of the area in which the phone is located. These maps are then made available for all stakeholders to view.

Vehicles traveling quickly might need to be tracked more frequently. Although the update frequency of the phone's position can be controlled by the center, a more advanced or intelligent approach is needed to keep updates consistent with real-time operations. This process is described in a later section.

Common Operating Picture

Tracking High-Valued Assets

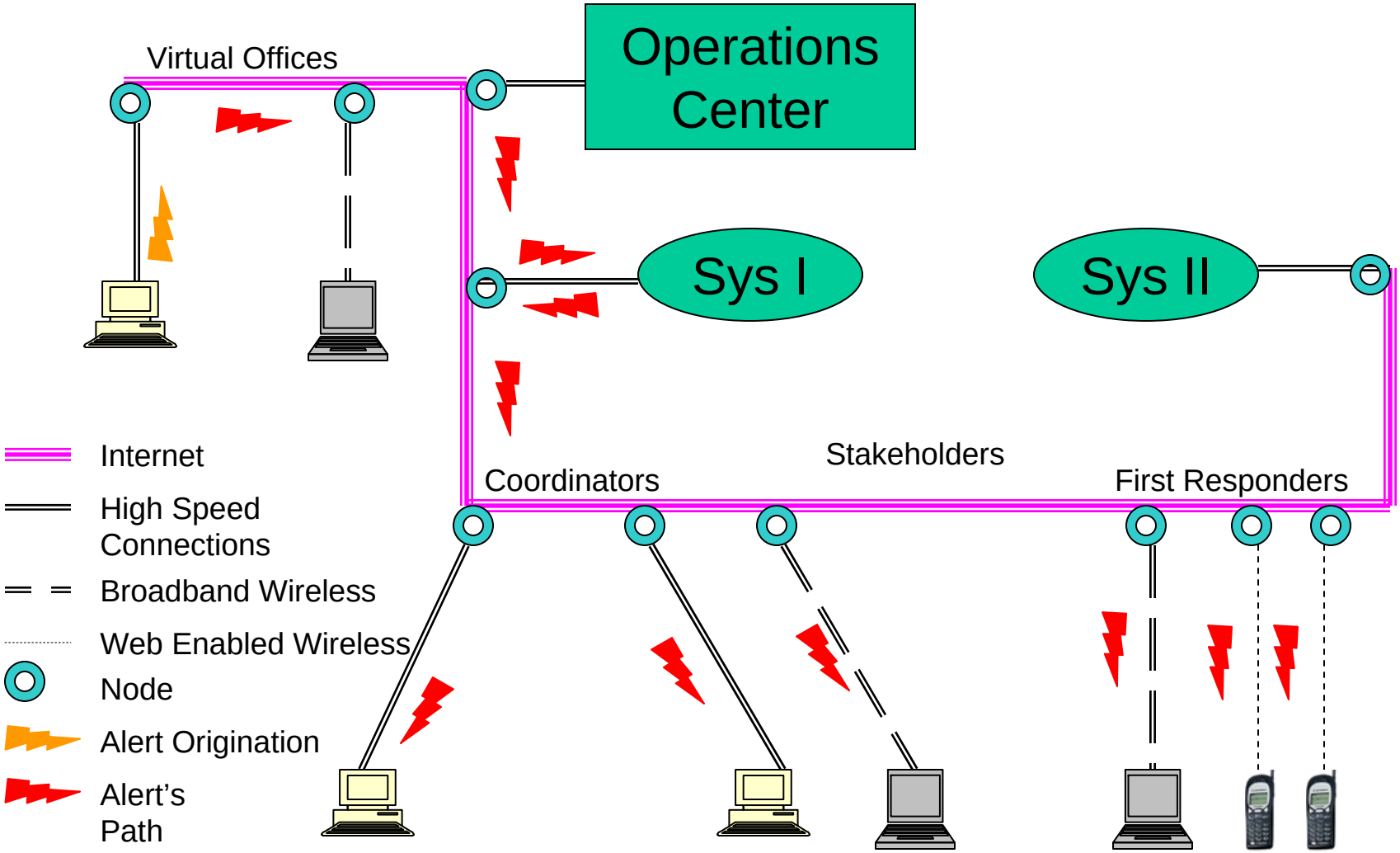


d. Alerting the Stakeholders

Another important function of an information sharing and coordination center is to be able to quickly alert the stakeholders when a significant event occurs. The type of alerts of interest depends on the community of users supported by the system. For example, in the case of RAPID Center, occurrences that might endanger the military cargo being transported are of interest—especially to organizations charged with protecting it and organizations expecting to receive it. On the other hand, the sighting of a suspicious person in a sensitive area might be reason to alert counterterrorism stakeholders—especially those responsible for guarding the area. Emergency management organizations might want to be alerted if an event occurs to which they need to respond.

Current communications permits alerts to be sent in a number of different ways. One popular approach is to send Short Message Service (SMS) messages to mobile/cell phones. While many mobile/cell phones can receive these types of messages, some cannot. However, although all mobile/cell phones can receive some type of text messages, services such as the phone providing the user with an indication that it has received an SMS message may not be available from all wireless providers. Email is another popular means of sending alerts. It can be sent to mobile devices and PCs that have appropriate communications connections. It should be noted, however, that many mobile/cell phones are not equipped to receive email.

Alerting the Stakeholders

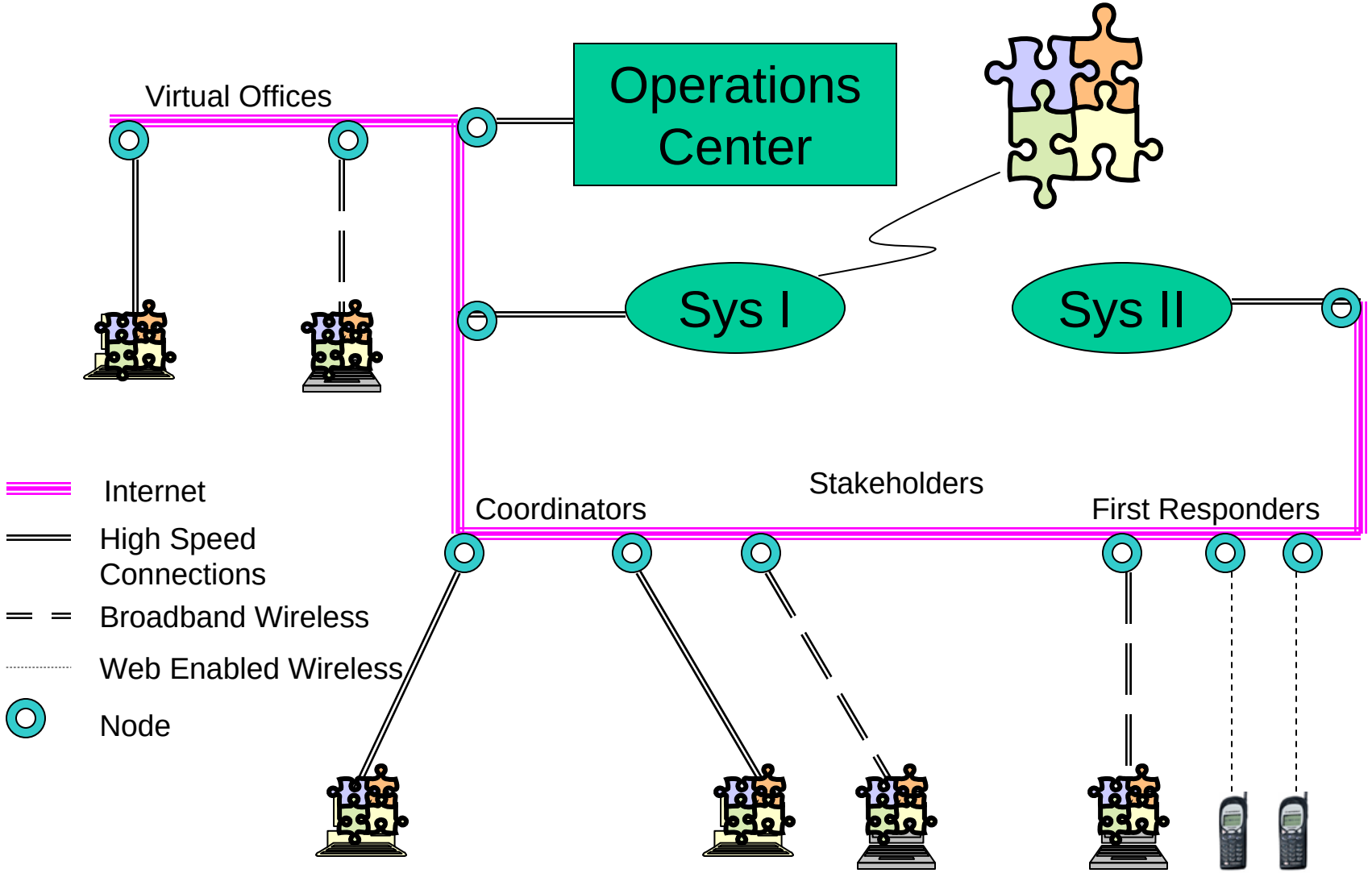


e. Virtual Collaboration

This figure shows the addition of virtual collaboration.[2] This capability, which has been available on the RAPID Center's support system, allows users to enter graphics such as maps, charts, and pictures for all or a selected portion of the stakeholders to view. This capability is depicted in the chart as a set of puzzle pieces, all of which fit together to make an understandable picture. A set of markers is generally available so users can draw on the currently displayed graphic to call attention to specific items. Text chat and file sharing are usually available in the collaboration tools.

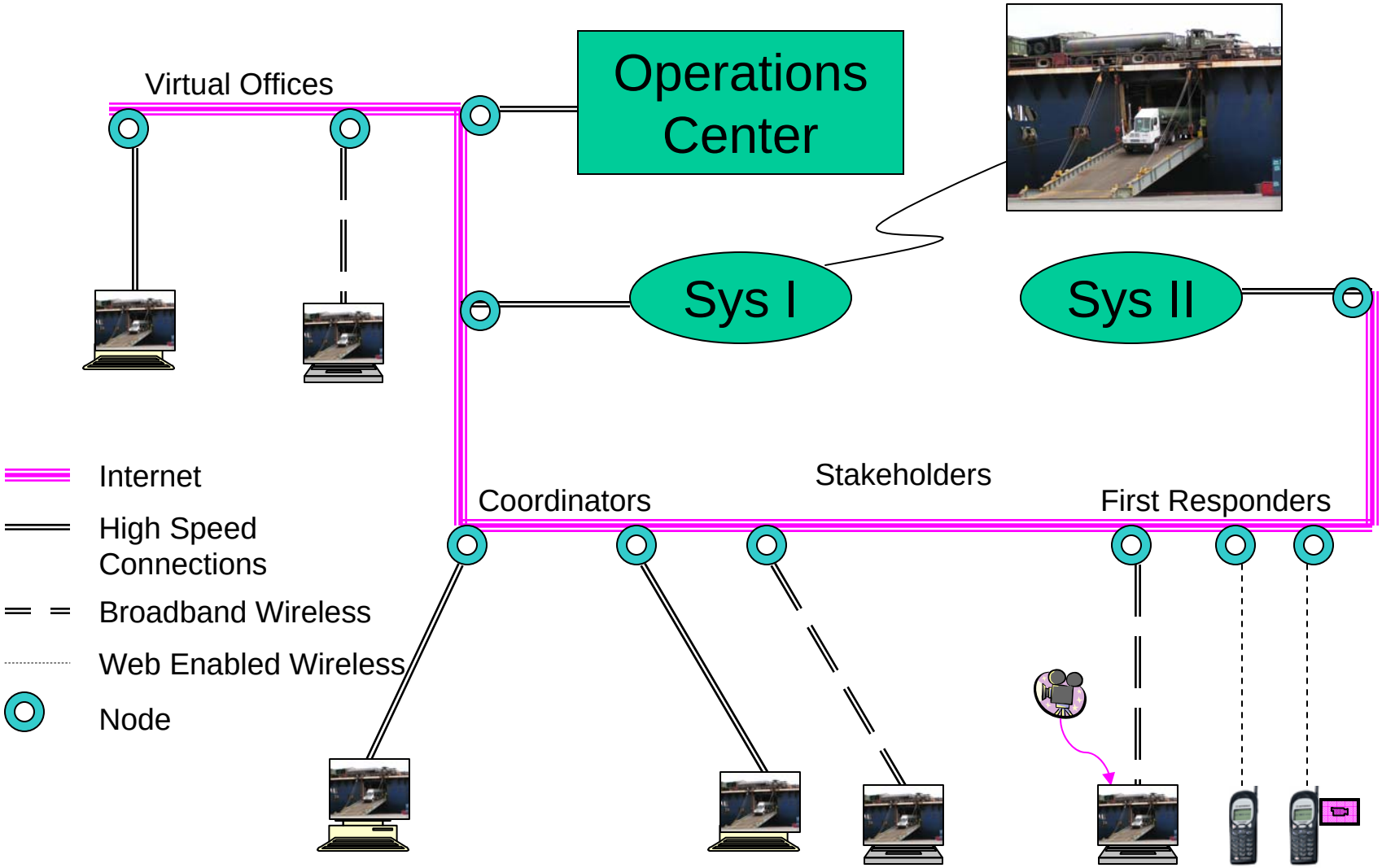
[2] See for example, Adobe Acrobat Connect Professional (previously Macromedia's Breeze) at http://www.adobe.com/products/acrobatconnectpro/

Virtual Collaboration



This figure shows the addition of real-time inputs. In this case, the first responder on the right has a camera phone. He is able to take pictures of scenes at the site of the disaster and send them directly to the center's system, which then permits all of the engaged stakeholders to view and discuss them. The left most responder has a video camera attached to his laptop. He can take video clips showing dynamic occurrences at the disaster site and send them back as streaming video for the engaged stakeholders to view and discuss. These as well as other real-time and near-real-time means permit those on the scene to provide up-to-date information to their decision makers. Further, it enables decision makers to share and discuss the material with other decision makers to develop optimum approaches to overcome existing problems.

Virtual Collaboration
with Real-Time Input



5. Desirable Attributes

Discussions with current and potential customers indicated that, to be considered for their type of operations, a center and its support system (herein referred to as the System) would have to exhibit certain characteristics. These are shown in this chart.

Generally, it is to be expected that preference would be given to duplicating a System that is already in use and utilizes off-the-shelf equipment. Further, since one size does not fit all, the System would need to be adaptable. Features that make operations supported by the System survivable would count heavily in their favor. The System would need to be responsive, that is, enable quick and accurate reaction to operations (e.g., emergencies) it is designed to handle. The System needs to be able to operate in a secure manner so that none of the information being shared falls into the wrong hands. And, of course, all of this needs to be provided at a reasonable cost.

Desirable Attributes
of Information Sharing and Coordination Centers

Centers and Supporting Systems Need to be:

- Off-the-Shelf & In Use
- Adaptable & Scalable
- Survivable
- Responsive
- Low Cost
- Secure

6. Communications Aspects

Unless appropriate planning is given to the main as well as the backup communications, it has the potential to be the Achilles Heel of these types of centers. So many methods might be used to communicate with all of the different users, the support systems involved, the devices that one is tracking, etc., that having all of the right communications at the right time is a significant challenge. One approach is to use the least expensive communications that can handle the job, but have more robust, and probably more expensive, communications available for when required. For example, in quiet times, a center might use common land lines for the main voice communications with cellular for its mobile operators and stakeholders. If a disaster disrupted those services, the center might switch to satellite communications.

During major events—terrorist attacks, earthquakes, etc.—normal communications infrastructures may be affected and not available. Mitigations to such disruptions include non-interruptible/backup power supplies, incident reserve frequencies (such as military WARM modes), redundant survivable communications, and so forth. While beyond the scope of this development effort, we recognize these contingencies and suggest that there be adequate planning to overcome these disruptions in the event they occur.

Communications Aspects
Some Options

	Rapid Center[a]		Mobile User		Website
	Voice	Website	Voice	Website	
Under Normal Conditions	Wired	Tx Line	Wireless	Broadband Wireless	--[b]
Under Abnormal Conditions[e]	Wireless VOIP Satellite	Broadband Wireless Broadband Satellite	VOIP[c] Satellite	Broadband Satellite[d]	--[b]

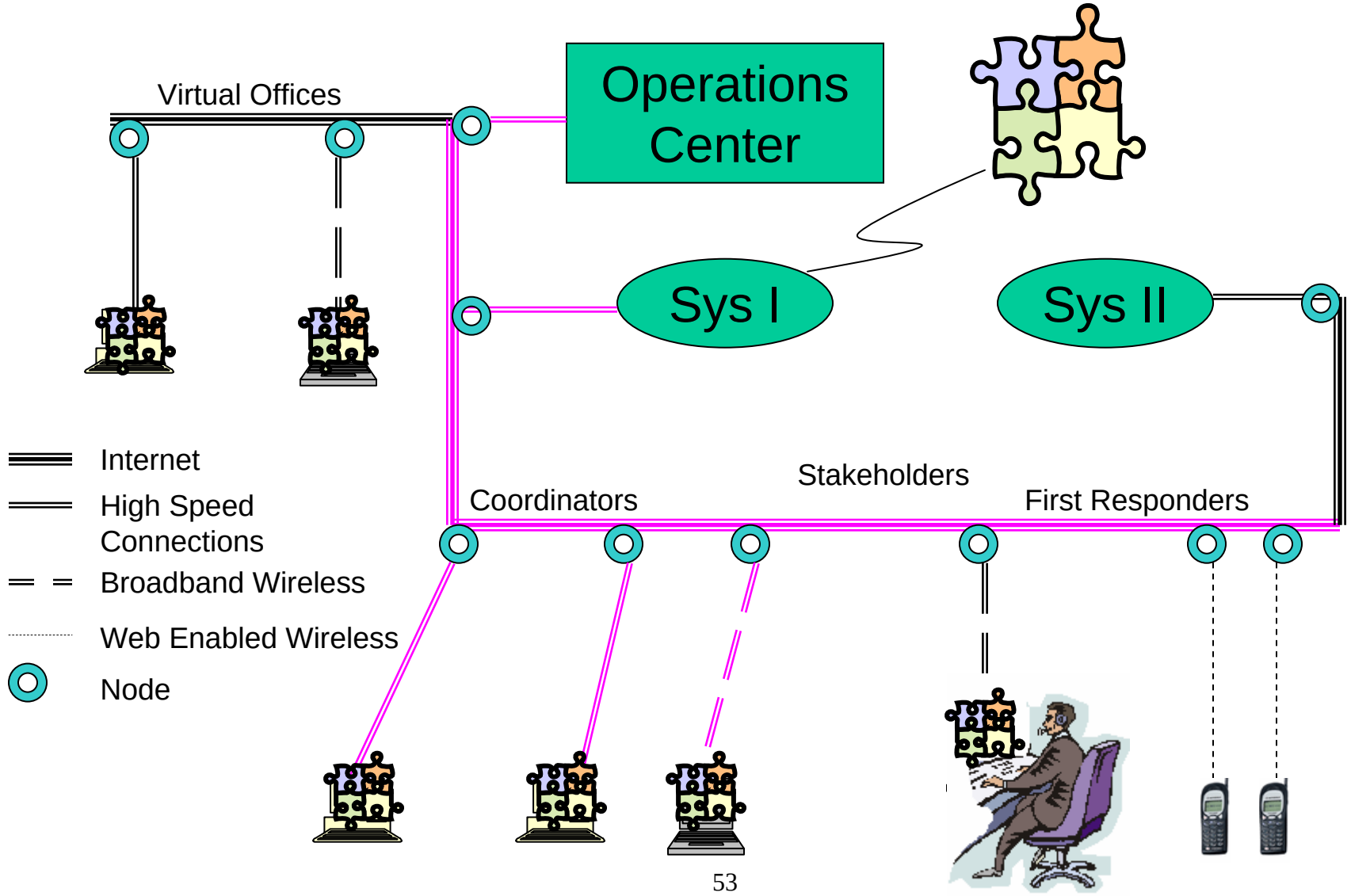
[a] Fixed user's communications is dependant on the facility the user is in.
[b] System might use multiple, Internet-connected websites in greatly separated facilities.
[c] VOIP, for example, Skype at www.skype.com
[d] For example, HughesNet Services at www.hns.com
[e] High intensity situations may need Wireless Priority Services. See wps.ncs.gov

VOIP is shown here in part because it uses the Internet as its transportation media, as does the rest of the center. At this point in time, VOIP is rather new. However, it has come a long way since its introduction just a few years ago, and some companies, including IDA, have begun to use it. Since most computers, including laptops, come with audio jacks and the capability to process audio coupled with free VOIP service,[3] it has the appeal of being convenient if not perfect. Further, if not one's primary communications means, it certainly could act as a backup. More on this in the next section.

[3] See for example, Skype at www.skype.com

Communication Aspects

Virtual Collaboration Using Voice Over IP (VOIP)



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CURRENT APPLICATION OF ADVANCED OPERATIONAL CONCEPTS

C. CURRENT APPLICATION OF ADVANCED OPERATIONAL CONCEPTS

In the previous section, we discussed desirable attributes of information sharing and coordination centers. How does the current system stack up against the requirement? This section examines the attributes of a specific current system in light of those that are desired.

The section starts with an overview of the system used by RAPID Center. It then examines the attributes of that system. The timeframe of this assessment is December 31, 2006. A much more detailed examination of the attributes of the current system can be found in Appendix A.

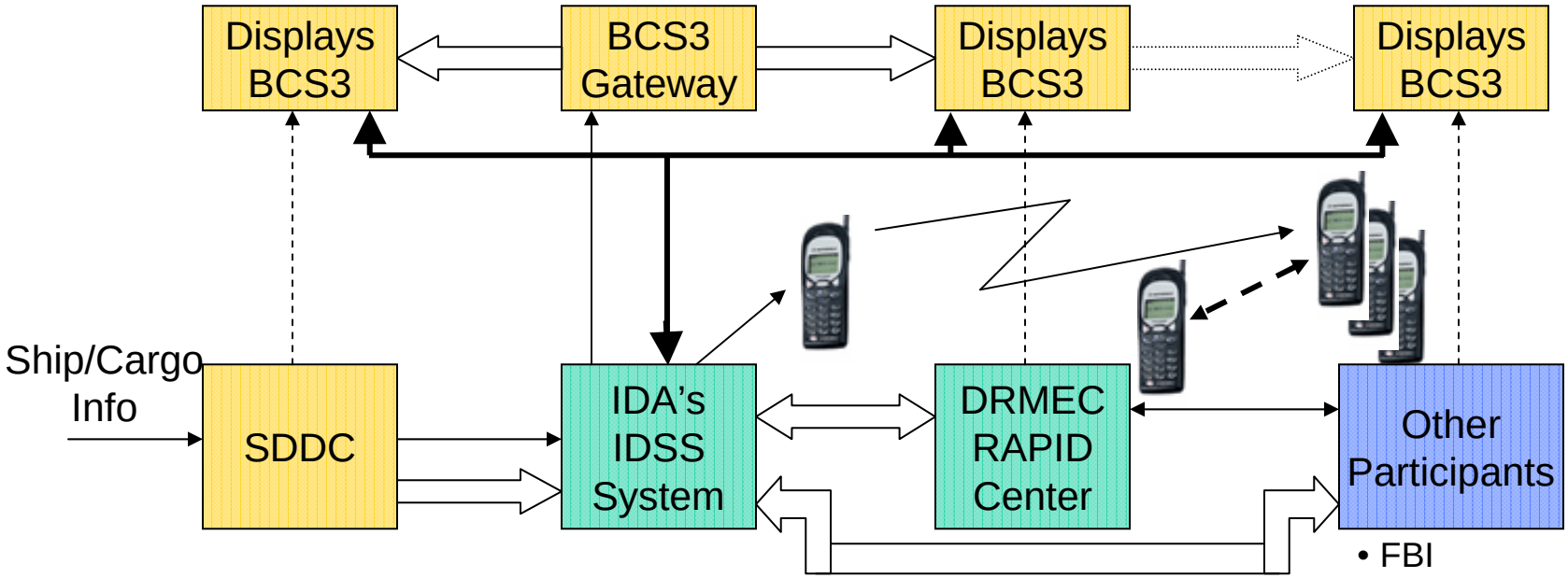
1. Overview of Current System

DRMEC's RAPID Center supports the movement of war materiel between forts and depots and ships at ports within the United States. These operations improve the security and accountability of these shipments. IDA's Information Distribution Support System (IDSS) supports RAPID Center's operations. IDA Document D-3249[4] describes the evolution of this system from its initial concept to the initial system. The chart illustrates the IDSS System and RAPID Center as they are used in support of the movement of military equipment through the port of Philadelphia. The following chart shows the current Main Menu for the IDSS system. Using IDSS, RAPID Center is able to carry out its mission in a centralized, distributed, or virtual mode, or any combination of these modes, as will be described in the next section.

The system provides a COP for RAPID Center's users by way of a secure website. The current version contains modules to handle a number of different types of information, four of which are discussed here: logistics, security, reports, and tracking. The logistics module contains lists of cargo to be moved between forts and depots, and the ship(s) being supported. They differ from the cargo manifest in that these lists contain information on where each item is located (e.g., on the ship, at the port, between the fort and the port) and how it is being moved (e.g., truck, train, military).

[4] Reference 1

Overview of Current System



- Manifest
- Cargo List
- Port Clearance Plan
- Scanned Data
  - Off/On-loaded from/to Ship
  - Leaving From/ Arriving At Port

- Current Information
  - Logistics
  - Security (Alerts)
- Photos
- Reports
- User Controls for IDSS

- Monitor Movement of Shipments between Ports and Forts and Depots
- Provide Updates to the IDSS System
- Generate Alerts
- Generate Reports
- User Administration for IDSS

- FBI
- Port Security
- Philadelphia Police
- PA EMA
- PA NG
- Coast Guard
- INS
- NCIS
- Civil Air Patrol
- Local Police Along Routes

Each item of cargo contains an identification (ID) tag, which is scanned each time it is moved from one mode of transportation to another (e.g., taken off the ship or placed on a truck) or in or out of storage at the port. The system contains an automated means of processing this scanned information to keep the cargo list updated.

The security module contains the capability to send alerts to users who need specific information. An example would be to inform users of a terrorist attack that could affect cargo movement. The current system has communications means for sending out alerts: text messages sent to mobile phones and email. IDSS System's User Information pages are used to specify user's mobile phone numbers and service providers, email addresses, and the user's preferences for receiving the messages. For most mobile phones, the text messages are sent using the GSM SMS. Messages sent to NEXTEL mobile phones use NEXTEL's paging service. The IDSS System can also collect and maintain data on the status of transmissions to each device including dates and times they were sent from the IDSS System, were sent by the service provider to the phone, and were read by the recipient.

The reports module provides the capability for selected users at RAPID Center to upload summary reports of logistics and security activities. These summaries can be viewed by all users of RAPID System.

MAIN MENU - Philadelphia

- LOGISTICS MODULE
- SECURITY MODULE
- COLLABORATION MODULE
- STORYBOARD MODULE
- SELECT PORT
- DAILY REPORTS
  - Logistics - Upload new Logistics file
  - Security - Upload new Security file
- Email Commander's Report
- Upload WPS Status file
- TRACKING MODULE
- USER INFORMATION
- SYSTEM ADMINISTRATION
- LOGOFF

IDSS also has the capability to accept position information from tracking devices and to display that information on a street map, a satellite photo, or a combination of both. IDSS uses wireless devices, such as modified, GPS-equipped mobile phones attached to the cargo, to collect the data and allows those in RAPID Center to adjust the frequency with which each device reports its position.

IDSS tracking can be used in many ways. As an example, this chart shows a partial track of a vehicle moving from Virginia to Michigan. The vehicle was actually being used as a mobile office and contained a member of the RAPID Center team supporting the discharge of cargo from a ship in Philadelphia. The operator was connected to IDSS by a broadband wireless link and to the Center by a mobile phone. The demonstration was used to show that IDSS provides RAPID Center with the capability to operate in the virtual mode.

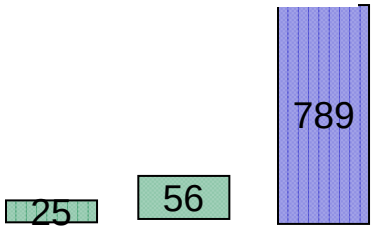
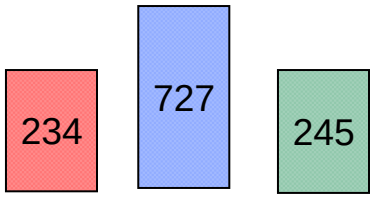
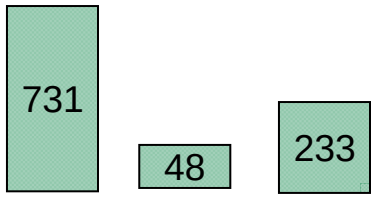
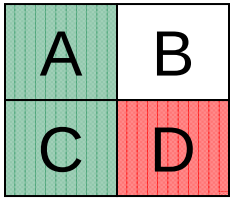
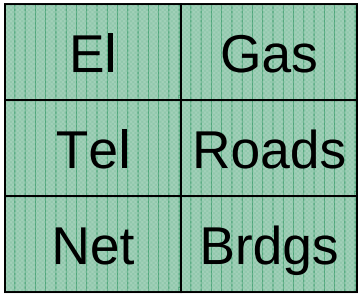
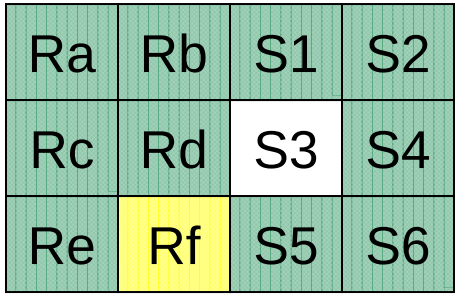
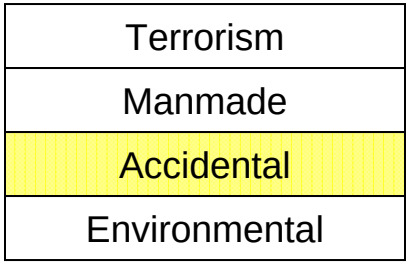
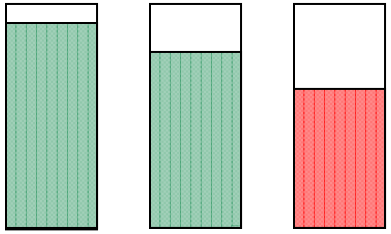
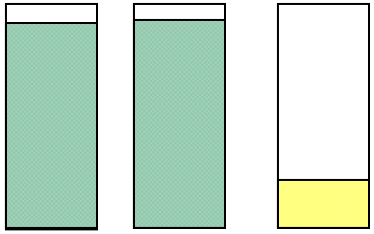
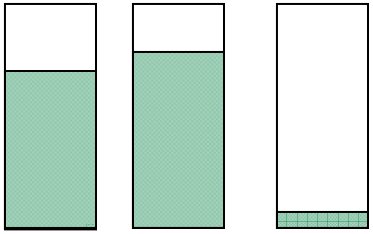
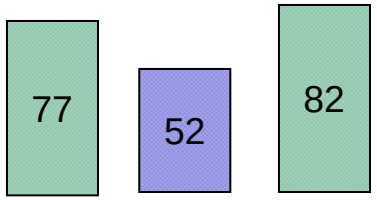
The interface between the IDSS System and the Army's Battlefield Command and Sustainment Support System (BCS3) allows BCS3 users to obtain selected information directly from RAPID System. When a BCS3 user clicks on a "hot spot" on the BCS3 screen, a process containing a specific URL is started. The URL is used to activate a process in IDSS that provides the BCS3 workstation with the desired data, which it then displays for the user. This process ensures that the user always sees the current information. An example of a "hot spot" would be the location of a fort, the data desired would be the cargo in transit to that fort, and the status of each item of that cargo.

Unit	Last Report Date/Time	Display unit history	Set Update Interval
C4034	12/15/06 22:16:30	2 Hr 12 Hr 24 Hr 48 Hr 72 Hr 1 Wk 2 Wk 4 Wk	3 5 10 30 Display History

RAPID System is a spiral development effort. Following each demonstration, new features are added and existing ones are upgraded. With this development, RAPID Center has become the center of an information hub with many of the people who are involved in emergency management, along with those who would need to respond to a disaster, able to connect to its system (IDA's IDSS). Thus, RAPID Center is in a good position to support the real-time information sharing and collaboration necessary for the managers and first responders to coordinate their efforts to bring about a rapid and efficient response to a disaster. Concepts for additional applications to support these operations are provided in Section E. As an example, the following is provided.

There are many concepts for what constitutes a common operating picture. A map showing the current locations of priority assets is one. This chart shows another. The object in this type of display is to use simple diagrams and colors to provide users with a quick view of the current situation—a "situation-at-a-glance" approach. Clicking on any of the squares or a menu item at the top takes the user to additional information on that topic or area. A "news" ticker at the bottom scrolls information on selected topics. The dropdown box in the lower right of the screen is used to select the particular topic of interest to the user.

RAPID Center, which includes this platform, is being expanded to provide the worldwide capability and common operating pictures needed by Secure Data Device (SDDC), AMC and Headquarters, Department of the Army (HQDA G4.)

OVERVIEW	MAP VIEW	WEATHER	MENU
Packard Ave Ship: Sea Hawk 10/21/06 – 10/22/06	Tioga Ship: Venture II 10/22/06 – 10/23/06	Pier 78 & 80 Denver Due 10/31/06	Pier 38 & 40 Ship: Radical 10/21/06 – 10/22/06
			
Waterways 	Infrastructure 	Refineries/Storage 	Incidents 
Police Dept 	Fire Dept 	Rescue Squads 	Hospitals 

…There has been an accident at Refinery E. Refinery emergency team has it under control. Waterway D…

2. Attributes of Current System

As shown in this chart, the current IDSS system meets all of the criteria noted in the conversations with current and potential customers. It has been used for several years to support RAPID Center's operations; other versions of it have been used for more than 20 years to support operations at various organizations within the DoD. All hardware and software, except for the programs that are developed to support an organization's unique requirements, are "off-the-shelf." It was conceived with the fundamental objective of being adaptable and has been configured to meet the requirements of many different organizations. Using PC-based hardware and software coupled with only the user organizations' unique requirements needing to be developed, leads to low costs. Its design follows DoD's requirements for this type of system. More details can be found in Appendix A and in Reference 1.

Attributes of Current Approach

- ✓ Off-the-Shelf & In Use
- ✓ Adaptable & Scalable
- ✓ Survivable
- ✓ Responsive
- ✓ Low Cost
- ✓ Secure

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TESTS AND DEMONSTRATIONS

D. TESTS AND DEMONSTRATIONS

As already noted, RAPID Center and IDSS, the system supporting it, are being developed in a spiral development fashion. Generally, for features that are envisioned as having the potential to provide significant additional capability, technology is developed to the point where demonstrations can be provided. If these demonstrations provide the appropriate indication that a desired capability is possible, the technology, perhaps with additional development, is incorporated into the system.

During the period covered by this report, improvements have been made in the following three areas: communications, operational capability, and tracking. While these capabilities have been mentioned earlier in this document, the purpose of this section is to provide additional detail on the communications and operational capability improvements. Improvements in the system's ability to track mobile phones is covered in Reference 3.

Tests and Demonstrations

1. Communications
   a. Broadband Wireless
   b. Voice Over IP
2. Operational Capability
   a. Distributed Mode (Operations)
   b. Virtual Mode (Operation)
3. Tracking

1. Communications

a. Broadband Wireless

Broadband wireless communications provides high-speed Internet service for mobile computers. Users can be stationary while using the service or they can be moving, e.g., in a vehicle. Typical download speeds range from 70 kbps to 2 Mbps.

The availability of broadband wireless communications is highly dependent on the part of the country in which one is. For example, in the 22311 zip code, the two prominent providers are Verizon and AT&T (Cingular). Verizon[5] provides 400-700 kbps average download speed, requires a BroadbandAccess compatible card, and uses VZAccess Manager software. AT&T provides[6] 70-135 kbps average download speeds on its EDGE network and 400-700 kbps on its BroadbandConnect network. A compatible interface card is required to connect the user's computer to the AT&T network and AT&T provides software called Communications Manager to aid the user in this connection. Due to availability at IDA, Verizon's BroadbandAccess was selected for use in testing.

It was found that the Verizon card is easily moved from laptop to laptop. The software is easy to use and the card automatically connects to the network. Connections worked well in the Northern Virginia area as well as on a road trip from Virginia to Michigan, as previously described.

The cost would appear to be high for occasional use. However, the ability to operate while on the move provides a significant advantage that may not be measurable in dollars alone. Even with the advertised 180 Metropolitan areas being covered, some areas of interest may not be covered, especially rural areas. The need to remove the card before storing the laptop was judged to be a minor inconvenience.

[5] Reference 4
[6] Reference 5

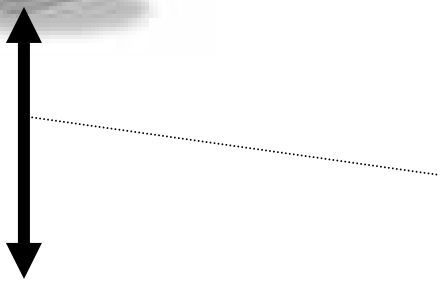
Communications
Broadband Wireless

<u>Advantages - Verizon</u>

- Mobility - 180 Metropolitan Areas
- Simplicity – Insert PC Card (Install Software)
- User Friendly - Auto Connects

<u>Disadvantages - Verizon</u>

- Cost still high
- Some areas not covered
- Card should be removed before storing laptop in bag



IDSS

Broadband Wireless Connection to the Internet (Verizon) 400-700 kbps average download speed

b. Voice Over IP

VOIP is a way to take analog audio signals, such as normal speech, and turn them into digital data that can be transmitted over the Internet. That is, VOIP can turn a standard Internet connection, including broadband wireless connections, into a way to place phone calls that entirely bypasses phone company services. So if normal wired and wireless phone services become unavailable, voice communications are possible using this technology.

At least three different implementations of VOIP service are in common use today as discussed as follows.

Analog Telephone Adapter (*ATA)*, the simplest and most common approach, is an analog-to-digital converter that takes the analog signal from a traditional phone and converts it into digital data for transmission over the Internet. Providers such as Vonage and AT&T use this approach.

Specialized *IP Phones* look like normal phones with a handset, cradle, and buttons, but have an RJ-45 Ethernet connector (instead of the standard RJ-11) and can connect directly to a router. They have all hardware and software necessary to handle IP calls. In the near term, these phones are expected to include Wi-Fi capability, allowing users to make VOIP calls from Wi-Fi hot spots.

Computer-to-Computer—Computers equipped with appropriate software, microphones, speakers, sound cards, and Internet connections, preferably fast ones like those available through a cable modem or DSL, can be used to make VOIP calls from one computer to another. Companies such as Skype (www.skype.com) offer this type of service, which is currently free.

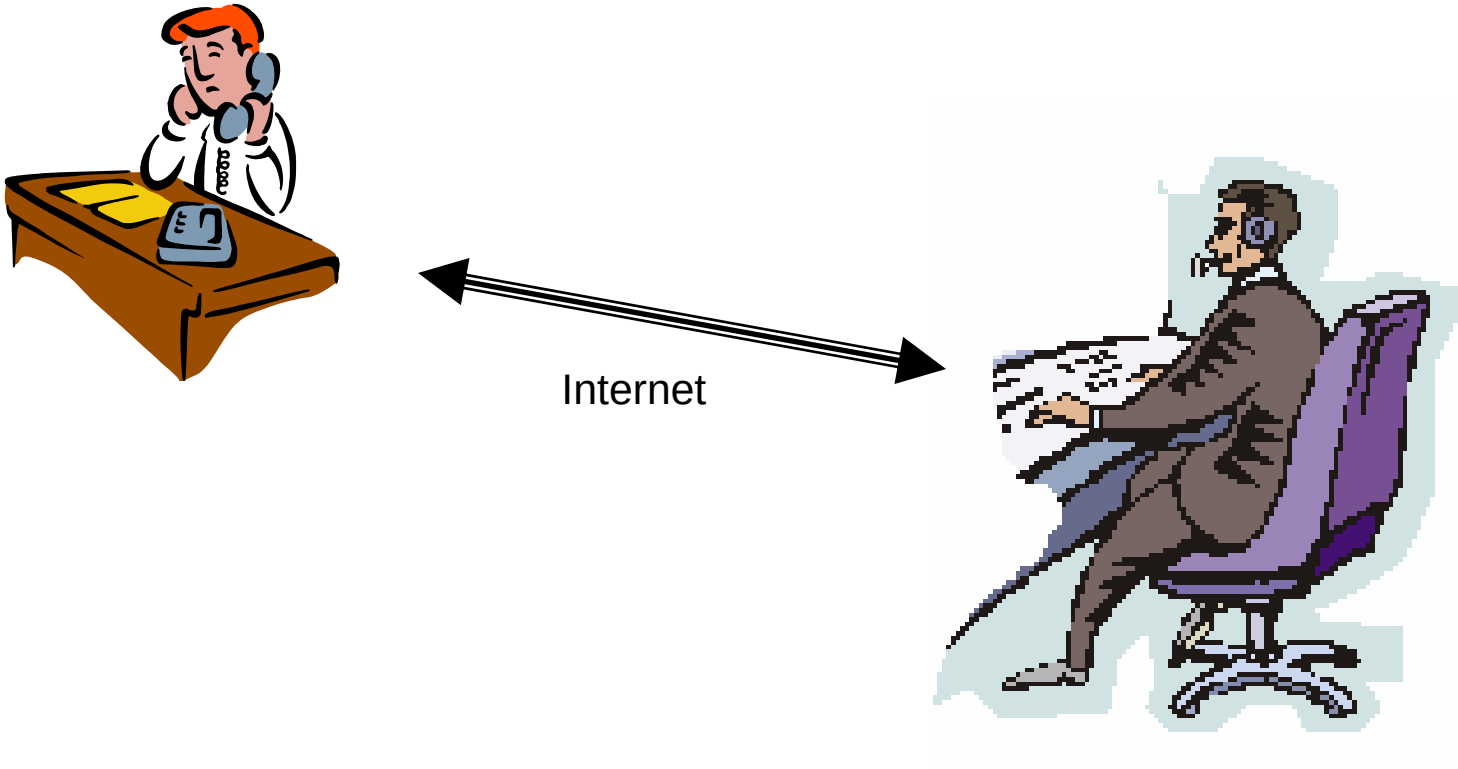
Some phone companies already use VOIP to streamline their networks. By routing thousands of phone calls through a circuit switch and into an IP gateway, they can significantly reduce the bandwidth (and cost) required for long distance communications. Once the call is received by a gateway on the other side of the call, it is decompressed, reassembled, and routed to a local circuit switch.

Some VOIP providers offer features similar to those offered by wired and wireless phone service providers, such as call forwarding and voice mailboxes.[7] Lower cost, especially that associated with long distance calls, is often the reason for using VOIP rather than more conventional services.

To obtain insight into VOIP services, the team tried Skype. Registration was easy and free, as advertised. The necessary software was downloaded from the Skype site and setup was accomplished without significant effect. Calls were easy to make. The only problem of note in the early testing was voice quality, which, while usable, was not close to that of the normal wired phone. However, the reasons for that have not been determined and it may be associated with the equipment used rather than the Skype service.

[7] For example see http://electronics.howstuffworks.com/ip-telephony.htm

Voice Over IP (VOIP)



2. Operational Capability

a. Distributed Mode

IDA's IDSS development team has operated in the distributed mode for many years, especially in monitoring system operations.

Up to December 2005, the operators carrying out the RAPID Center functions, especially those interacting with the IDSS system, had always been collocated in a single physical facility. In December 2005, a ship arrived later than expected, and the facility RAPID Center planned to use was no longer available. IDA suggested that the Center move to a distributed mode of operation. DRMEC agreed and moved some operators to their facility in Trevose, PA, where they could access the Internet with high-speed connections. Others, who had high-speed Internet access at their homes, DRMEC sent home to work. All were able to carry out their functions in the normal fashion. The demonstration was highly successful.

In February and March of 2006, RAPID Center supported the offloading of the USNS Pomeroy in Savannah, GA. Initially, RAPID Center was set up in Savannah. However, toward the end of this operation, RAPID Center was moved to the DRMEC facility in Trevose, PA, again demonstrating the ease with which RAPID Center can switch to operate in a distributed mode.

These demonstrations are important for several reasons. First, the distributed mode helps to reduce RAPID Center's signature, which reduces the likelihood of it becoming a target. Second, the distributed mode can help reduce costs by allowing operation with a significant portion of the force at their home base and only a minimal force at the port.

.

Operational Capability
Distributed Mode

- IDSS Developers Utilize Distributed Operations
- RAPID Center Distributed Operations
    - Dec 05 - Philadelphia, PA
    - Feb-Mar 06 - Savannah, GA, USNS Pomeroy
- Advantages
  - Reduced targetable signature
  - Reduced costs

b. Virtual Mode

As previously noted, IDA's system development team has long operated in the distributed mode, especially in monitoring system operations. Recently, the team added the capability to operate in the virtual mode. This has been enabled by the addition of broadband wireless capability. This communications capability has been incorporated into laptops and permits those responsible for monitoring system operations to carry out those functions from virtually any location—even from a moving vehicle.

Being able to operate in the virtual mode further reduces the targetable signature of the center, since at least some of the operators are capable of operating on the move. The ability of operating from unprepared sites is certainly an advantage if an emergency arises. Costs may be lower given that prepared sites do not have to be maintained.

Operational Capability
Virtual Mode

- Virtual Operations using IDSS
- RAPID Center Virtual Operation Demonstration
- Advantages
  - Further reduced targetable signature
  - Enhanced emergency capability
  - Further reduced costs

Virtual mode operations were demonstrated in July 2006 as one of the team's members successfully supported a ship operation while being driven from Virginia to Michigan. He was equipped with a laptop connected to IDSS, RAPID Center's support system, through the Internet by a Verizon broadband card inserted in the laptop. He also had voice communications through a mobile phone provided by the project. The cell phone is equipped with a program that periodically reports its position to IDSS in the same manner as is done when the tracking device is attached to an element of cargo. A portion of the track of the operator's trip is shown in the chart. Given that this information is available to the operators in RAPID Center, the whereabouts of team members is always available to them.

Unit	Last Report Date/Time	Display unit history								Set Update Interval				
C4034	12/15/06 22:16:30	2 Hr	12 Hr	24 Hr	48 Hr	72 Hr	1 Wk	2 Wk	4 Wk	3	5	10	30	Display History

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SOME ADDITIONAL APPLICATIONS

E. SOME ADDITIONAL APPLICATIONS

As discussed in the previous section, IDSS is currently being used to support RAPID Center. It could also be used to support a number of other types of operations. Two are discussed here: Maritime Domain Awareness, and Emergency Management and Disaster Recovery. While some of the applications needed to support these operations would need to be developed, the main system elements required are already part of IDSS as it was specifically designed to facilitate this type of reuse.[8]

There are a large number of ports within the United States. Many of these ports and the locales in which they exist would benefit from improved knowledge of the situation surrounding the port area. Further, local, state, and federal stakeholders would benefit by having access to a common operating picture that succinctly shows the situation.[9] IDSS contains other features that would benefit these organizations. For example, it has the capability to alert the stakeholders when conditions reach threshold levels. It provides the capability for stakeholders to hold virtual collaboration meetings. In addition, it has the capability to display, in map format, the locations of high-valued mobile assets as they move about the area. Some of these are described in the following pages.

Since the benefits are similar for those involved in Emergency Management and Disaster Response, the following discussion applies to those efforts as well. The ports at Philadelphia and the Delaware River are used in the maps, graphics, and in the discussion. However, the techniques discussed are applicable to many situations.

[8] Reference 1.

[9] Reference 2.

Some Additional Applications

1. Maritime Domain Awareness
2. Emergency Management & Disaster Response

This chart shows an example of a main menu that might be used in a situation awareness system. The options on the right already exist in the current IDSS, as do some parts of the options on the left. However, most of the capability to support the options on the left would need to be developed to support specific needs of a particular operation. Some ideas for these options are discussed in the following text.

Main Menu

- **SITUATION AWARENESS**
  - **OVERVIEW STATUS**
  - **MAP DISPLAY**
  - **DAILY REPORTS**
  - **HAZARDOUS materiel/CARGO**
  - **INFRASTRUCTURE STATUS**
  - **WEATHER**
- **ALERTS CONTROL MODULE**
- **COLLABORATION MODULE**
- **TRACKING CONTROL MODULE**
- **EMERGENCY POCs**
- **USER INFORMATION**
- **SYSTEM ADMINISTRATION**
- **LOGOFF**

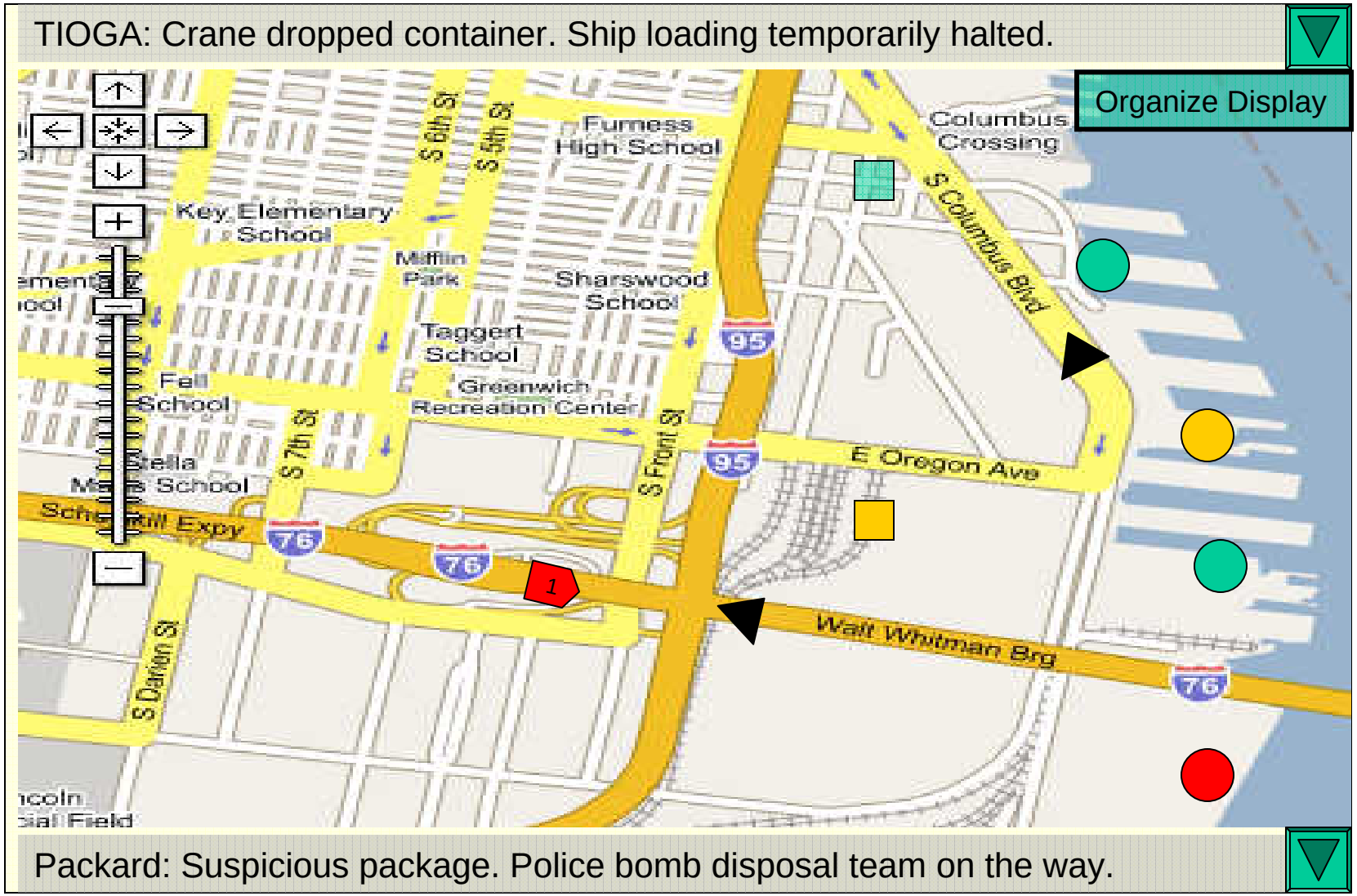
1. Situation Awareness—Map Display

A Situation Awareness Map Display could be used to provide, nearly at a glance, the situation in the area of interest. The displays presented herein are meant to be updated in (near) real-time and made available to appropriate users as they have need for the information. The map display contains three major sections, all of which can be user configurable.

The map in the center contains colored objects that denote the status of the facilities of interest (e.g., the port terminals) as well as occurrences of interest at other locations (e.g., bomb found on railroad tracks servicing a terminal). All objects use the Department of Homeland Security's colors to indicate significance and have drill-down capability. That is, clicking on an object will bring up a window with details associated with the object represented. These details can include a summary of the situation along with related pictures and supporting video and audio. In addition, in certain cases, a daily report might be included. The map contains scroll and zoom controls and can be switched to satellite and hybrid views. Controls are provided allowing the user to select which type of objects are to be displayed on his or her screen.

The top of the screen contains a one or two line summary of the most important situation related to maritime operations. The background color can be changed to indicate the degree of importance. The control on the right allows the user to select the facility or area most important to his or her efforts. The bottom of the screen contains a "news" ticker summary of important maritime-related happenings in the area. Again, the background color can be changed and the control on the right allows the user to filter the summary to his or her areas of interest.

Situation Awareness Display



Situation at Monitored Areas

Situation at Ad Hock Areas

Camera

N Tracked Vehicle

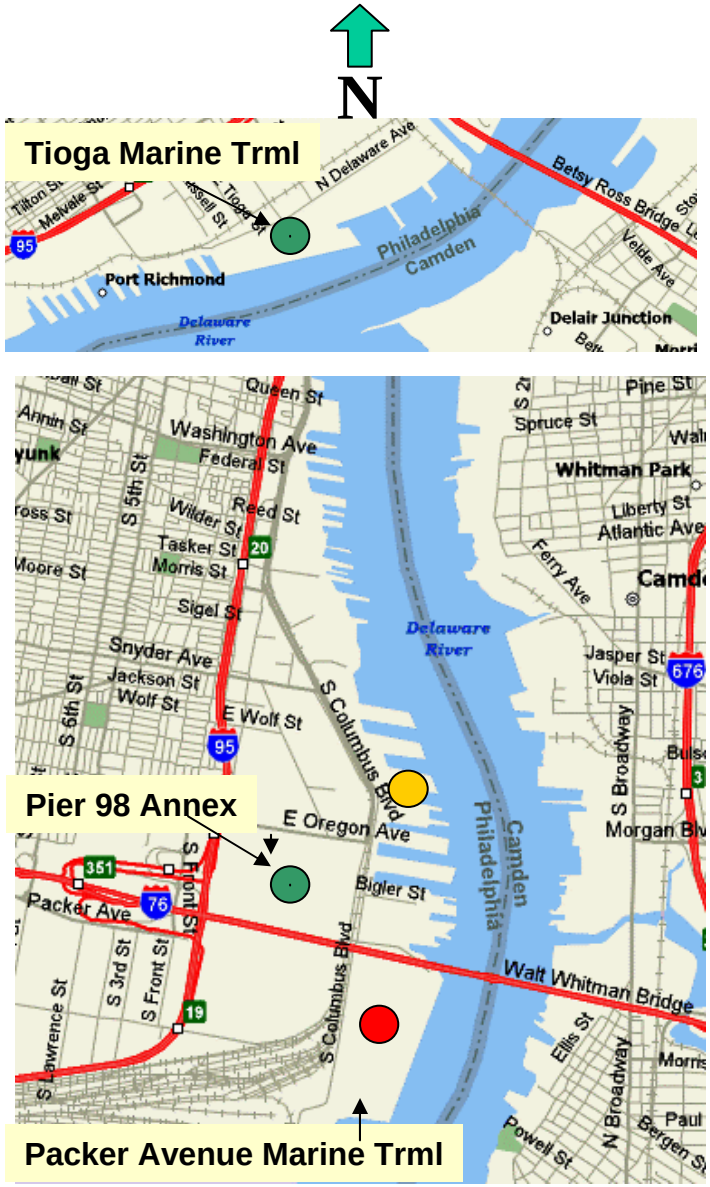
2. Situation Awareness—Table View

Another approach to providing a quick summary is to provide a table with or without an associated map. In this example, the table contains three columns: the terminal names to the left, a stoplight status in the middle, and status descriptors to the right. Again, clicking on an object in the map would bring up a window, as previously described, with details of the situation at the location represented by the object.

Situation Awareness
Table View

PA Terminals		Discussion
Packer Ave Marine Tm. Strategic seaport facility, steel, meat, fruit, heavy lift.		Closed due to fire
Pier 98 Annex – Staging area for mil. Cargo, other cargo, rail service		Operational
Tioga Terminal Home Berth to 2 Military Sealift Command LMSRs		Operational
Pier 78 & 80 Forest Products Dist. Center		Center partially closed due to flood
Pier 38 & 40 Part of Forest Dist Ctr		Operational
Pier 84 Cocoa Handling Facility		Operational
Pier 82 Fruit Handling Facility		Operational
Pier 96		

Open with restrictions Fully operational Closed



Click on any dot in graph above or on map above for details

3. Situation Awareness—Channel Status

This chart provides an example of what a channel status display might look like. The map is optional as it may be useful in some situations, but not in others. Clicking on an object on the map will bring up a window, as previously described, with details of the situation at the location represented by the object.

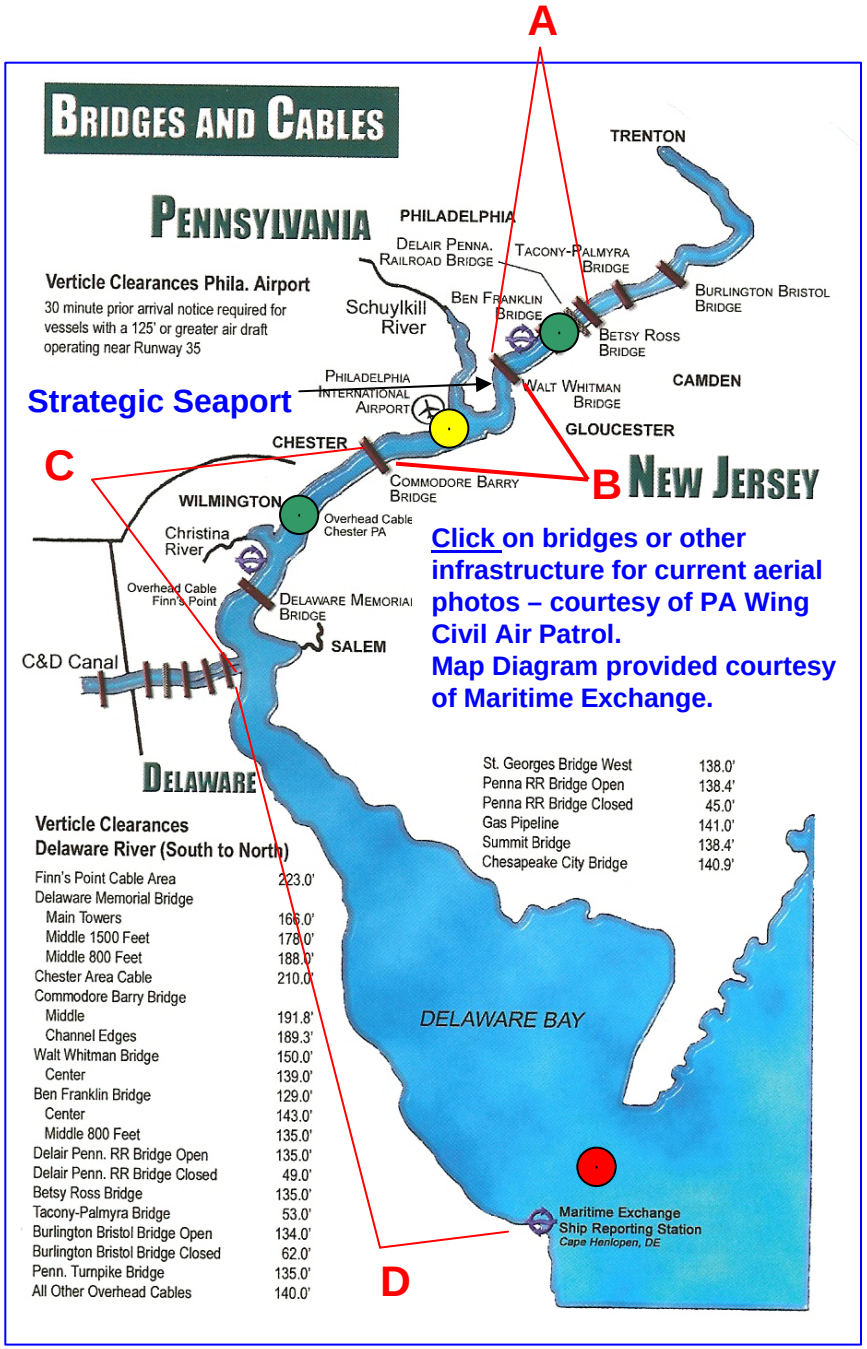
Clicking on bridges or other infrastructure shown on the map will, where available, bring up a list of current photos including aerial photos, which might be provided by the local Wing of the Civil Air Patrol.

Situation Awareness
Channel Status – Delaware Bay

Port/Waterway		Discussion
Walt Whitman to Betsy Ross Bridge - Area "A" [a]		Operational
Commodore Barry to Walt Whitman Bridge – Area "B" [a]		Caution due to ongoing work
C&D Canal to Commodore Barry Bridge – Area "C" [a]		Operational
Breakwater Anchorage, entrance to Delaware Bay, to the C&D Canal – Area "D" [a]		Entrance closed due to high winds
Specific Incident/Site Area		N/A

[a] See Map

Open with restrictions Fully operational Closed



4. Situation Awareness—Overall Status

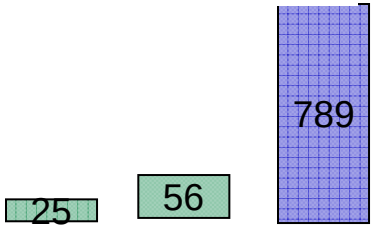
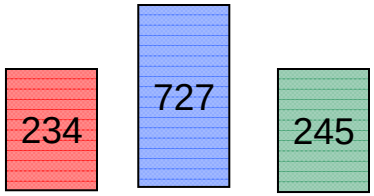
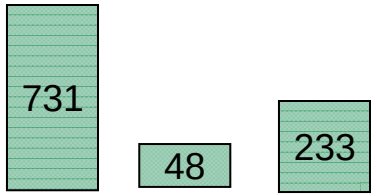
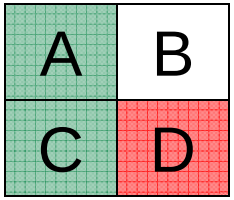
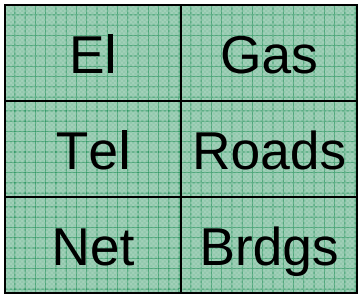
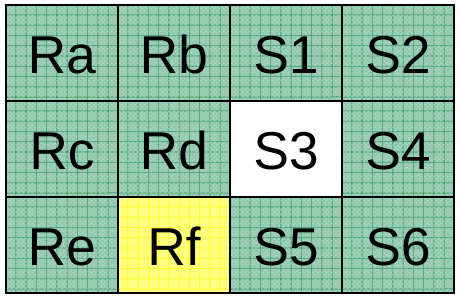
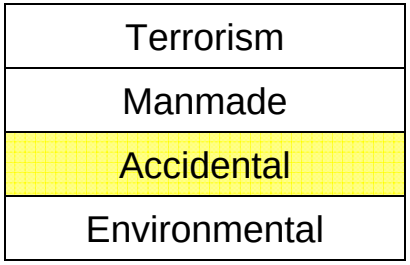
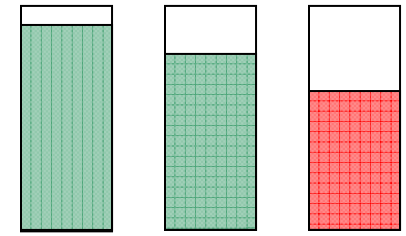
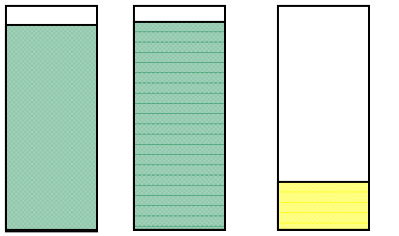
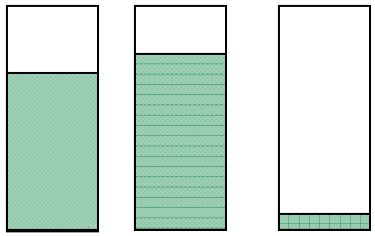
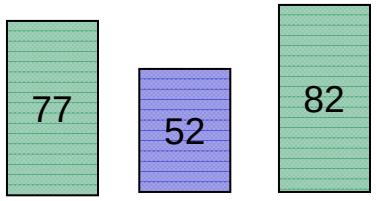
This chart shows another approach. The menu bar at the top is used to control the display. Four options in this version are shown: Overview, Map View, Weather and Menu.

An overview display is shown in the here. It has three sections in the three rows. The top row presents the status at four ports of interest. At the bottom is a "news" ticker to provide up-to-date situation awareness information on what is happening in general or in a particular area. The arrow button to the right allows the user to select the area of specific interest. Some of this is already being implemented for RAPID Center.

The middle row represents infrastructure status in a broad sense. The bottom row is the status of the resources that would be used to handle emergencies if they arise.

The color and, where appropriate, the height of the graphic would provide status information to users. For example, red might indicate that an event has occurred and that outside help is needed to deal with it, whereas yellow might mean the incident is under control by organic means. Clicking on a graphic could bring up a window with more information about the incident and how it is being handled.

The Map View is as described previously. Weather would be from a publicly available Internet. The Menu option is to permit the user to reconfigure the screen to meet his or her needs.

OVERVIEW	MAP VIEW	WEATHER	MENU
Packard Ave Ship: Sea Hawk 10/21/06 – 10/22/06	Tioga Ship: Venture II 10/22/06 – 10/23/06	Pier 78 & 80 Denver Due 10/31/06	Pier 38 & 40 Ship: Radical 10/21/06 – 10/22/06
			
Waterways 	Infrastructure 	Refineries/Storage 	Incidents 
Police Dept 	Fire Dept 	Rescue Squads 	Hospitals 
…There has been an accident at Refinery E. Refinery emergency team has it under control. Waterway D…			

5. Situation Awareness—Highway/Bridge/Rail Area Status

This chart provides an example of what a highway/ bridge/rail status display might look like. Again, a map is optional since it maybe useful in some situations but not in others.

Situation Awareness
Highway/Bridge/Rail Area Status

Highway/Bridges/Rail		Discussion
Streets in near vicinity of Packer Ave Marine Terminal, Pier 98 Annex, other Terminals		Partially blocked by fire equipment at Pier 98 Annex
I-95		Operational
I- 676		Operational
I- 76		Crash at S 7 St
Commodore Barry Bridge		Operational
Walt Whitman Bridge		Operational
Betsy Ross Bridge		Operational
Rail Line/CSX Rail Philadelphia Status		Caution – fire at Pier 98 Annex

Open with restrictions Fully operational Closed

This area might contain a map showing the major bridges, highways and rail assets of interest.

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REFERENCES

1. *The Development of RAPID System: From Concept to Initial Use and Beyond – Status Report*, IDA Document D-3249, February 2006.
2. Proposal to DHS under its Port Security Grant Program for development of the Delaware River Virtual Maritime Domain Awareness Center for the port of Philadelphia, grant applicant - Pennsylvania State Police, 2007.
3. *IDSS For RAPID Center – A Status Report*, IDA Document, (not yet published) http://b2b.vzw.com/broadband/serviceoverview.html.
4. http://business.cingular.com/businesscenter/solutions/wireless-laptop/connections-coverage.jsp

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Appendix A

ATTRIBUTES OF CURRENT APPLICATION

Attributes of IDSS-Based Current Approach

Off-the-Shelf & In Use

- Approach and technology have supported a wide variety of operational needs:
  - IDSS[a] was developed at the request of DoD. IDSS based systems have been used by DoD for more than 20 years – Examples:
    - OSD Office of Defense Cooperation
    - Conventional Forces Reduction in Europe Treaty
    - DISA
    - JS/J8
  - Current systems
    - Security Assistance Network (DoD/DSCA)
    - Military Cargo Security and Accountability Network (DRMEC)

[a] See Appendix B of reference 1

DSCA – Defense Security and Cooperation Agency

Attributes of Current Approach, cont.

Adaptability

- Center and supporting systems are:
  - Easily modifiable to meet new or changing requirements
  - Scalable
- Servers and server network designed to accommodate range of demands

Attributes of Current Approach, cont.

Survivability

- Servers and internal server network designed to be fault tolerant and are equipped with backup power
- Daily backups with offsite storage
- Not dependant on any one communications system, e.g., utilize multiple wired and wireless phone systems *with satellite backup*
- *Use of multiple servers in different locations tied together through the Internet*
- Approach accommodates distributed workforce - operators not required to be in same physical location
- Operators not required to be in pre-established locations
- Operators free to change their location
- No Single Point Failures

Items in italics are planned. They are shown for completeness only.

Attributes of Current Approach, cont.

Responsive

- Capable of quick activation – move from standby to operational mode
- Units can move to new sites
- Units can operate in transit

Attributes of Current Approach, cont.

Low Cost

- Basic elements of support systems are operational
- Approach uses low cost wired and wireless communications *with more expensive satellite communications as backup*
- Support system is modular - buy, build, utilize only those modules that are needed

Secure Operation

- Support portal uses login with username and password along with secure communications
- Main portal in secure facility manned by cleared personnel

Items in italics are planned. They are shown for completeness only.

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Appendix B

GLOSSARY

Appendix B
GLOSSARY

AMC	Army Materiel Command
ATA	Analog Telephone Adapter
BCS3	Battle Command Sustainment Support System
CONUS	continental United States
COP	common operating picture
COTS	commercial off-the-shelf
DHS	Department of Homeland Security
DLA	Defense Logistics Agency
DoD	Department of Defense
DoT	Department of Transportation
DRMEC	Delaware River Maritime Enterprise Council
DSCA	Defense Security Cooperation Agency
GPS	global positioning system
ID	identification
IDSS	Information Distribution Support System
MARAD	Maritime Administration of the Department of Transportation
MDA	Marine Domain Awareness
PA EMA	Pennsylvania Emergency Management Agency
PRPA	Philadelphia Regional Port Authority
R&D	research and development
RAPID	Regional Agile Port Intermodal Distribution
SDD	Secure Data Device
SMS	short message service
VOIP	Voice Over Internet Protocol

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14. ABSTRACT

The Federal Government has been working to increase the security of U.S. ports including the supply chains that move goods and materiel that pass through these ports. This is especially true in the case of war materiel moving between forts and depots in the United States and theaters of operation. The Delaware River Maritime Enterprise Council (DRMEC) has developed a facility, called RAPID Center, to support this effort.

Beginning in 2004, DRMEC tasked IDA to initiate the design, development, and demonstration of a pilot version of an online system to support RAPID Center, which in the beginning was housed in a fixed facility. However, given local as well as world conditions, it was deemed prudent to develop alternatives to the fixed faculty approach. Two alternatives seemed to have significant potential; distributed and virtual modes. In the distributed mode, personnel can conduct the center's operations from multiple locations that are distant from the site of the operation. In the virtual mode, the center's personnel can operate while on the move. This document provides a detailed discussion of these two approaches. It also describes other operations where these approaches may be useful.

15. SUBJECT TERMS

systems, computers, collaboration, port, security, cargo, alerts, counterterrorism, DRMEC, deployment, RAPID Center, RAPID System, wireless communications, mobile phones, virtual, information, distributed

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